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EDITORIAL NOTES.

Local Authorities and Calorific Power.

As expected, local authorities in opposition to Gas Bills this session are already showing signs of asking for the insertion of a calorific value test where one is not already provided for. The first indication of this has been supplied by the Brentford Company's Bill, in connection with which there is no direct proposal to alter the present illuminating power test, other than, we take it, to make the standard in the proposed annexed area conform with that in the old area. The local authorities, however, do not seem to be very definite as to what they really want—some appear to be in favour of a calorific value clause supplanting the illuminating power one, while others are desirous of seeing (unjustly and injudiciously) a test for two qualities placed on the Company. The Company meantime are quite indifferent as to whether the illuminating power test continues, or whether it is replaced by a reasonable calorific power one. They most certainly do not want a dual standard of quality; and Mr. Balfour Browne, K.C., who is representing one of the opposing District Councils, says he, for one, will not be a party to asking for the imposition of a double test. In the desire of some of the Councils for a dual standard, we can now see the mischief that was done, by both example and precedent, when the London County Council forced the Gas Light and Coke Company in 1909 to come under the double standard and penalty test. From the illuminating power one, however, the Company are now seeking release. By the agreement in 1912 with the single standard in the cases of the Wandsworth and South Suburban Gas Companies, the County Council, in effect, agreed that the calorific value test suffices. But they are in opposition now to the Gas Light and Coke Bill; and it seems that we were correct in our recent announcement that this Bill was likely to be made the one around which debate would fall to settle definitely for the general guidance what should be done in connection with the future standard and test. Mr. Honoratus Lloyd, K.C., when opening the case on the Brentford Bill, mentioned that a "full-dress" debate was to take place on the Gas Light Bill, and that the Brentford Company had agreed with the London County Council to fall into line with any decision come to on the Gas Light Bill. The other authorities appeared to be more or less content with this agreement; and it was really an easy way out of the muddle in which the authorities would have found themselves—some wanting one thing, some another, and one or two not knowing precisely what it was they did want.

However, we hope that this does not portend that there will be any question raised as to the maintenance of two standards and two tests. The Gas Light and Coke Company have had experience of working to two standard qualities, and have found it exceedingly irksome; and as probably upwards of 90 per cent. of the gas sold is now employed for its heating power, calorific value is the only quality of which it is now necessary to base any test. To inflict some other standard or stipulation—except perhaps that the gas when burned without a mantle should have a luminous flame—would be a direct repulse to the progressive endeavours of the gas industry to serve the public, under new circumstances, in the most economical and useful way. There is no Continental country where anything in the nature of a dual standard obtains; and it is to-day recognized by scientists and men who understand the position that calorific value, and that only, is the thing that matters. At the same time, there is no town gas supply abroad or at home which is worked under, or to, a calorific standard which is devoid of illuminating power. So that if our legislators accept the correct view, they will not place any obligation upon the industry, by way of supplement to the calorific standard, which will be in any way onerous. We do not anticipate they will. But should there unfortunately be any legislative mistake made in this connection, it would do very serious harm to the gas industry; and we should then unhesitatingly urge the undertakings, with calorific value proposals in their Bills, to withdraw them, and decline to concur in any attempt at undue imposition. We repeat that it is not anticipated that anything of the kind will happen. But the facts have to be faced that there are local authorities who are aiming at a dual standard, and that there is always uncertainty about the fate of things in Parliament. However, the London County Council (as pointed out earlier) agreed to calorific value only in two Acts of the session of 1912; and, as to the Metropolitan Gas Referees, we know, from what Professor Vernon Boys said at the time the question of the stripping of town gas of benzol was being discussed early last summer, that he at any rate considers it a wicked waste to keep in town gas that which is wanted by motorists, and which is of comparatively little value to the present-day gas consumer. Whether or not we agree with him is not the question. But what he said does not suggest that he, among the Referees, is prepared to advocate the perpetuation of illuminating power as a standard to which gas suppliers should work. The choice is really between calorific value and illuminating power; and common sense unanimously votes for the former. It is the duty of everyone in the gas industry, in this matter, to think of the future, and not do anything to assist in promoting a condition that would be to the ultimate disadvantage of the industry.

The Local Government Board and Steel Mains.

A SINGULAR action has been taken by the Local Government Board in connection with the application for a loan by the Tredegar District Council, part of which loan was required for the laying of Mannesmann steel tubes for gas distribution purposes. The loan has been approved, with a stipulation attached that no portion of the money is to be expended on Mannesmann tubes. In the stipulation, Mannesmann tubes are specifically mentioned; and therefore, if the published reports properly present the terms of the communication of the Board, then the Council would have been quite within the right in interpreting the decision as meaning that steel tubes of makes other than Mannesmann could be employed. Naturally, there has been a strong protest against the decision of the Board, on the grounds that it was unjustifiable in point of experience, and that it savoured of a direct act of injustice to the British Mannesmann Company. If, however, a statement that has since appeared in the "South Wales Daily News" is authoritative, as is alleged, the Local Government Board are not blameless regarding the form of their communication to the Tredegar Council. The Board have never before, so far as we are aware, refused sanction to a loan for steel tubes for gas purposes; and there would have been some rather sharp things said had they done so. If, however, it is, as asserted, the practice of the Board, while giving thirty years for the repayment of loans for cast-iron pipes, only to allow twenty years for untapped steel tubes and fifteen years when they are to be tapped, why did they not intimate this in communicating their decision to the Council, and suggest that any part of the loan spent on steel tubes would have a shorter repayment period attached to it than the rest of the loan for mains? This would have been preferable to bluntly saying that "the loans are approved on "condition that no payments will be made in respect of Man-"nesmann steel tubes out of the amount now sanctioned for "mains." It would be interesting to learn whether the Board have not in the past allowed longer repayment periods than those named for money spent on steel mains.

It will be a great pity if the use of a very valuable type of mains is restricted, in the case of local authorities owning gas undertakings, by the period for the repayment of loans spent on them being unnecessarily limited. It it stated that the shorter repayment periods have been fixed, "because "the Board are advised by their engineering experts that

"steel tubes have a shorter life" than (presumably) cast iron. This would depend on circumstances. We are rather afraid that there are some ill-formed notions lurking about in the official mind in regard to the use of steel tubes, just as there were at one time, but not now, on the subject of circular water reservoirs built of reinforced concrete. Experience seems to suggest that the ties of tradition that are to be found in certain parts of Whitehall are allowed to hinder progress somewhat. The engineering advisers of the Board may not be the engineers with the greatest practical experience of the usefulness and actual life of steel mains. If the Board require solid information as to practical experience to pit against their own information on the subject, gas engineers throughout the country could supply it; and its character would fully prove the economy, advantages, and reliability of steel tubes for the transmission of gas. There are steel mains of the Mannesmann type that have been in use in this country for a dozen years and more, and abroad for upwards of a score of years; so that experience is not lacking. We are glad to see, in view of the general technical interest that attaches to the matter, that the Tredegar Council are going to try to obtain from the central authority an official statement as to their action. Mr. D. W. Davies, the Gas Engineer to the Council, is preparing a report to be forwarded to the Board; and we trust that the intelligence is correct that the Board will supply an explanation. But we also hope, if the explanation is on the lines of the one already put forward as "authoritative," that the Board will supplement it with something of a technical nature which will enable discussion of the point as to whether the counsel of their advisers is well-founded.

Getting in Touch with the Manufacturers.

We have all come to the conclusion that the manufacturing world presents extensive scope for trading by the gas industry. In practically every industry where heat is needed, we see gas is being applied to some purpose or other. We see, too, that the manufacturers themselves are becoming more and more interested in the potency of gas in matters of economy, speeding-up of work, in creating greater cleanliness, and in eliminating the labour attaching to the old methods of heating furnaces, crucibles, and so forth. But, with all the visible application and interest, there is considerable space in the industries within which to cultivate the modern gas methods. The more, indeed, the matter is looked into, the more is discerned the necessity for developing the best means of circulating among the technical and influential men of different industries intelligence as to what can be done in the way of gas heating, and information as to the benefits that are to be obtained by the suppressing of crude methods of application by the adoption of the refinements and efficiencies of the new methods. The Home Office Reports on Factories and Workshops, with the complaints of District Inspectors as to the crudeness with which gas is applied, and which show conclusively that the best efficiency and the highest economy are not being obtained from the gas consumed, are annual reminders that there is much to be done to establish properly and permanently the gas industry's relations with the manufacturing concerns of the country. The gas industry has more than ever of recent years adopted as a leading principle in its commercial transactions, that it is by the promotion of economical use and efficiency in the domestic and general applications of gas that progress is assured—in other words, by diminishing the quantity of gas required for any given purpose, more gas will be sold. This principle has worked out very well in material effect. The effect has proved, and continues to prove, the soundness of the principle. And what is true in the domestic and ordinary lines of gas use, is equally true in the applications of gas to industry.

The question, however, is how one can best get into touch with men of the different industries. Where there is any great competition between manufacturers, as a rule a good deal of conservatism still exists in regard to the admission of strangers into the factories; and it is often a wearisome job, although one tells in all good faith the tale of economy and efficiency, to get into the works of manufacturers, so as to be able to tender advice as to the best means of applying gas as the heating agent. The Birmingham Corporation Gas Department, the Sheffield Gas Company, and many other undertakings have shown that the bar of conservatism can be broken through, and with good effect to the gas business, by going the right way to work. The right way is not by first showing inquisitiveness as to what is going on within the manufacturers' own gates; but by trying to attract his attention and excite his curiosity and interest in the first instance outside his works. This done, the rest is plain sailing. Birmingham and Sheffield, when beginning seriously and zealously on the industrial business, did so by instituting laboratories and show-rooms, where furnaces, crucibles, and other industrial appliances could be seen, and not only seen, but tested in various ways. After that, *entrée* to works, and the acceptance and actual seeking of advice, follow. Now we have the Newcastle-upon-Tyne and Gateshead Gas Company taking another course, and setting an example that might with considerable advantage be followed by other large centrally placed gas concerns. The idea, we fancy, must have emanated from Mr. Thomas Waddom, the Secretary of the Company, after he heard the paper, which covered such extensive industrial ground, by Mr. H. M. Thornton at the meeting of the British Commercial Gas Association last October. That paper, it will be remembered, was addressed to gas men, with the view of furnishing information, by description and illustration, as to the extent of business the industrial territory offers.

The Newcastle idea was that a somewhat similar lecture, framed on suitable lines, would be a great benefit not only to the Company, but, knowing that good news spreads, to the gas industry generally. The Chairman of the Company (Sir W. H. Stephenson) and his colleagues, situated as they are in industrial Newcastle, are ardent believers in the virtue of educational work in developing trading; and therefore there was no difficulty at all in arranging for an industrial gas-heating lecture on very comprehensive lines. This was delivered on Thursday last. The British Commercial Gas Association paper supplied evidence as to Mr. Thornton's diligent and painstaking methods in collecting data and illustration concerning the industrial applications of gas, and as to his ability to present what he gathers, from his own business associations and by research, in an attractive manner. The lecture delivered at Newcastle, with the numerous lantern pictures and the subsequent demonstration with furnaces, was just what was expected of him, in view of his previous performance. But important and edifying as the lecture was, the point about the event that interests us in this article is the one of the opportunity that such an occasion affords for getting—in industrial areas crowded with operations in which a convenient heating process is required—into that preliminary touch with manufacturers which is essential, and so opening up their interest. The primary intention of the lecture was to be of direct educational service to the manufacturers in the Company's area, rather than technically informative to the men of the gas industry. The invitations to the lecture were sent out with studied care, so as to secure as much value from it as possible. They were forwarded to manufacturers, to municipal representatives, to the local press, to certain of the professors and students at Armstrong College, and to the District Association of Foreman Engineers and Draughtsmen. The presence of the engineers and secretaries of gas undertakings in the area covered by the North of England Gas Managers' Association was also invited.

Thorough local educational effort of this kind must be of advantage not only to the local undertaking, but to the gas industry generally; for the influences of what was heard and what was seen during and subsequent to the lecture must spread far beyond the statutory confines of the Newcastle Company. The way in which the invitations were spread is suggestive, in association with this question of the distribution of information. Just as "greater economy and "works efficiency" are not always sufficient passwords for an agent to get beyond the gates of a factory, so they are not always sufficiently magnetic to draw the principals of manufacturing concerns from office, works, or home, to meetings to listen to lectures and witness demonstrations. The Newcastle Company, however, were fortunate in their acceptances by manufacturers and their technical managers. Next to the manufacturers themselves, the members of the manufacturers' staffs should be invited to lectures of the kind; and it was therefore a pleasure to learn that invitations were extended to the District Association of Foreman Engineers and Draughtsmen. Such men are both stationary and migratory. Those who are stationary are influential. Those who are migratory—those who have to move from place to place to "better" themselves—will carry with them information that they have acquired, and will influence the introduction of new processes wherever their

lot may be cast. The same, too, with the engineering students of Armstrong College. No one knows definitely the locations of the future official work of these students. It may be far from Newcastle; it may be in remote parts of the world. Look down the list of the members of the Institution of Junior Engineers, consult our own records of official appointments, and it is surprising to observe what a number of the home-trained men have taken for utilization abroad the knowledge gained in their native country. There is value, therefore, in this work of disseminating knowledge of gas-heating applications, and in planting useful information for future service by getting into contact with the technical colleges and schools. In every way we find suggestive the plans that the Newcastle Company formed for this lecture by Mr. Thornton; and, being suggestive, they are valuable as an example to others. There is confidence that more will be heard of this means—the getting into direct touch with manufacturers and their staffs—of stimulating the promising industrial load. The more the services of gas become known among manufacturers, the more gaseous methods of heating are adopted by them, the better commercially for both industries and country, and the better atmospherically for communities.

Plant Repairs and Maintenance.

THE subject with which Mr. Thomas G. Moffat, of the Tradeston Gas-Works, dealt in the paper he read on Saturday, before the Western Division of the Scottish Junior Association, is one about which we should like to hear more. The repair-shops are such important adjuncts to all gas-works of large and medium size, their equipment is now usually of the most modern approved types, and the work in them is so varied, with oftentimes unique experiences, that it appears to us there should be plenty of material emanating from them for fairly frequent papers, such as Mr. Moffat's, on the repair and maintenance of gas plant, which work materially assists in constituting the item in gas revenue accounts to which charges for repair and maintenance are placed. The paper is composed entirely of works' troubles, and how they were or are overcome; and, from beginning to end, we find considerable resource embodied in the methods of dealing with the difficulties to which allusion is made.

Perhaps the only thing about the paper that we are sorry to see is the brusque and undeserved despatch that is given to stoking machinery. "Now," remarks our author, "that "vertical retorts are being installed in most gas-works where "new plant is required, and as stoking machinery may be "relegated as a thing of the past, I have purposely left "such plant out." There we are not in agreement with Mr. Moffat. The time is not yet measurable when horizontal retort working will be finally abandoned, and when the question of repairing and maintaining stoking machinery will no longer be a matter of interest. We have only to look round the country and see the results that are being obtained from horizontal retort working, and learn the opinions of responsible engineers, to arrive at the conclusion that any idea that stoking machinery is already a "back number" is a mistake. Only this week there appears in our columns a description of new works at Cheltenham, built by that old and successful carbonizer, Mr. R. O. Paterson, in which West's compressed air combined charger and discharger is used on both sides of a bench of block-ended retorts. When questioned on the subject of this practice almost universally discarded in favour of the single-sided working of horizontal benches, Mr. Paterson replies by pointing to the results that he has obtained, and that are still being realized under the engineership of his successor (Mr. James Paterson), with plant that is not exactly *à la mode*. It is no use making the error of assuming to be an "accomplished fact" something which may happen in the distant future. There is nothing to be gained by deceiving ourselves in this way.

However, while stoking machinery may not be required any longer in some cases, and in diminishing amount in others, through vertical retort adoption, coal-breakers, elevators, and conveying plants (coal and coke) will be needed under any system of carbonization. It was impossible for the author to deal within the compass of a paper with all types of gas-works plant; but we are a little surprised to find there is nothing said in it about elevating and conveying plants, for experience is that these afford a good field for employment and ingenuity in the repair department. But in connection with the upkeep of coal-breakers, Mr. Moffat makes a suggestion that is worth copying. Coal-breaker shaft troubles are well known in almost every works where breakers are used. Makers are criticized for the mistake of having the shaft of one diameter. In such cases with wear, "it is impossible to make a satisfactory job of the bearing "when it is a solid bush." Trouble in this connection at Tradeston has led to sleeves of larger diameter than the shaft being fitted to take up the wear; and these can be renewed without scrapping the whole bearing, and having to go to the expense of new rollers. This is a good suggestion for saving trouble and expense. Attached to this matter is the question of efficient lubrication of the breaker. The author has a preference for mechanical oilers; and the bearings, after a year's experience, are found to be in good order. But we think for breaker bearings Stauffer's grease, in a tell-tale lubricator, requires a lot of beating. If the grease is liberally applied, it will soon squeeze out of the bearings, and so will form, as it were, a seal against coal and coke dust entering.

The question of the method of driving the breakers is one of importance in securing fair reliability and freedom from anxiety. We are not much enamoured of the direct coupling-up of breakers by steel gearing. Mr. Moffat speaks of the amount of strain that is thrown by the inrush of coal into the breaker, with the result that the engine is pulled up sharply, and, without great care in feeding (which care is not always a strong point with the men in charge), fracture is bound to occur sooner or later. It seems to us preferable that breaker-engines should be belt-driven, because, if there is a sudden inrush of coal, or any foreign hard substance is mixed with the coal, there is always the slip of the belt to rely upon, and before any damage is done the belt will come off. However, there are many breakers direct-coupled; and the favourable information given in the paper as to the brazing of fractures will be noted. So interest goes on through the remainder of the communication, in connection with repairs and the dealing with obstructions in mains. The trouble met with through an accident to an exhauster (the details of which are related in the paper) is a unique experience; and the manner of dealing with it supplies special evidence of the resource which, as we have said, is one of the marked features of the paper.

Coal Merchants and the Development of Coke Sales.

IT did not occur to us that there was even the possibility of the retail coal merchants raising any objection to gas undertakings exercising additional energy in developing local sales of coke; solid fuel being a commodity in which there is free trade. But it seems there are some of them who think that, in the case of municipal concerns, it is very wrong of the gas departments to put coke in competition with the ratepaying coal retailer. We know that the coal merchants resent very much the inroad that has been made on the domestic coal business by the adoption of gas-cookers and gas-fires; and we also know how, by the process of defamation, they have unsuccessfully tried to stem the flow of popularity. This process exhibited the very bad case they had to advance against the adoption of modern labour-saving and smokeless heating arrangements; and already some of them are sick of the sorry figure they have cut in taking up the attitude that they did. The coke business is on quite a different footing. It is one solid fuel against another solid fuel; and no doubt the coal merchants think that local sales should be entirely in their hands. There has been a little objection raised at Doncaster to the "hawking" of coke by the Corporation Gas Department, on the ground of competition with ratepayers. But the objection was quickly disposed of by a plain explanation of the position. There are really two points to raise in connection with it. The Corporation Gas Department cannot help producing coke, and in increasing quantities with advances of the gas business. They must dispose of the coke somehow; otherwise, failing disposal, the revenue produced by it would have to be made up in some other way, and the only other way is through the price of gas. Now what have retail coal merchants done towards helping gas undertakings to dispose of their coke? They have not hitherto made any special effort to cultivate its sale. They have not troubled to "hawk" it round in small quantities. They have done the least they possibly could towards promoting the development of a home-produced smokeless fuel. It has simply come to this, that the gas undertakings have had to take up the work that the coal merchants have failed to do. They have only themselves to thank that they have not made more of the coke side of the fuel business, which

has always up to now been open to them. At the same time, the coal retailers may depend upon it that, if they care to use more energy in promoting the local sale of coke, gas undertakings will not undercut them, providing their supplies are obtained from the local gas-works.

Gas-Cooker Efficiencies.

During the last few years, the makers of gas-heating appliances have been, from within their own circle, and to the advantage of gas suppliers and consumers, applying stimulus to each other by the springing of surprises. Here we have gas-fire efficiencies taking flight; there a new and (to the purchasers of gas-fires) acceptable standard of hygienic efficiency produced; there again cheaper gas-heated circulating-boilers for domestic use with greater efficiencies. By these performances in different quarters, energies are stimulated and exercised in others. It recently came to our knowledge that the laboratories of the Richmond Gas-Stove Company have, for some time, been engaged on somewhat neglected work—that of attempting to further improve the thermal efficiency of gas-cookers. The gas-cooker has long had to stand aside in the crush produced by the demand for new gas-heating apparatus and for a greater efficiency in gas-fires. But it has come to the front again; and probably we shall now hear a great deal more about the raising of its efficiency. The work the Richmond Company have been doing has resulted in a gratifying success. Hourly consumptions have been reduced, and heat efficiencies raised. The top-plate of the gas-cooker, being the part that is most used, has been the one where the greatest waste went on; and the heat efficiency—well, it was not anything to boast about, though, from the points of view of economy and convenience, there was nothing to beat the gas hot-plate. Economy and efficiency are synonymous terms; and when we find, as we now do with the improved Richmond cooker, the major part of the top-plate boasting an over-all heat efficiency of upwards of 40 per cent., it can be said that some good work has been accomplished. When the consumption of gas in the oven per cubic foot of oven-space is brought down to close upon half previous performance, there is additional ground for believing that a new order of things in connection with gas-cookers is at hand, which will enable the gas-industry to further out-distance would-be competitors. We have seen the new cooker as developed from experimental research; but it will, of course, require a little time to produce the cooker for the market.

Co-Partnership by Legislation?

The principle of co-partnership is making headway in the gas industry—though all too slowly for those who firmly believe in its efficacy as a remedy for labour disorders. In other directions, however, its progress seems to be less satisfactory. Why is this? With reference to some industries there are admittedly difficulties in the way of introducing a scheme; but there ought to be some means of surmounting these, or, at any rate, an endeavour might be made to do so. Recognition of the neglect to put forth such an effort, and of the need of some system which will improve the position of labour, has led Mr. James Hope, M.P., to introduce a Bill to promote the adoption of co-partnership by statutory and other companies. The Bill has been brought forward by him on more than one occasion previously; and even for this session he candidly admits that its prospects of passing are not good. But it is drawing wide attention to the subject, and that is what is wanted. Judging from an address which Mr. Hope delivered at the London Chamber of Commerce last week [as reported in another column of to-day's issue], his real object is to get the Bill referred to a Select Committee for consideration. Such a Committee, or a Royal Commission, would, of course, be the means of still further bringing to the notice of employers the principle of co-partnership. But the passing of such a Bill into law is another matter; and it is a contingency which the speakers at the meeting—and many will agree with them—did not regard with favour. It was not that fault was found with the basis of the proposed scheme—*i.e.*, a standard return for capital, a standard wage for labour, and a division of surplus profits when these have been secured. The feeling seemed to be that the matter was more one for individual arrangement between masters and men than for the interference of the Legislature. It was argued that an Act was unnecessary to permit the adoption of schemes by business enterprises; and surely it should be unnecessary to compel the introduction of a principle which has been proved to be followed by the most satisfactory results under suitable conditions.

"B.C.G.A." CONFERENCES AT PLYMOUTH AND BRADFORD.

Under the auspices of the British Commercial Gas Association, two District Conferences have already been arranged to be held. The first will take place at Plymouth on Friday, and the second at Bradford next Tuesday.

The South-Western Conference will be held under the presidency of Sir Joseph Bellamy, J.P., the Chairman of the Plymouth and Stonehouse Gas Company; and the proceedings will commence with a reception of members and visitors by the members of the Board. After some words of welcome by the President of the Conference, an address will be given by Mr. C. Stafford Ellery, of Bath, the Chairman of the District Conference Committee, to be followed by a paper by Mr. J. Armstrong, of Ilfracombe, on the "Increase of Sales by Local Publicity." In the evening, there will be a lecture by Professor Vivian B. Lewes, F.C.S., F.I.C., on the "Hygienic Value of Coal Gas as an Illuminant and a Fuel."

Very similar arrangements will be followed in regard to the conference at Bradford. This will be under the presidency of Mr. Councillor J. H. Barraclough, the Chairman of the Bradford Corporation Gas Committee. Following the reception of members and visitors by the Lord Mayor of Bradford (Alderman J. Arnold, J.P.), the visitors will be welcomed by the President of the Conference; and after an address by Mr. Edward Allen, M.Inst.C.E., of Liverpool, a paper will be read by Mr. Robert Watson, of Doncaster, on "Municipal Gas Undertakings and their Consumers." In the evening, Professor Vivian B. Lewes will deliver his lecture, on the "Hygienic Value of Coal Gas as an Illuminant and a Fuel," as to be given at Plymouth.

Other conferences arranged for, and particulars as to which will be given later on, are to be held at Cambridge, Leicester, Newcastle-on-Tyne, and Newport (Mon.). At all of these, we learn, Professor Lewes will give a lecture to which, and to a reception in connection therewith, local medical men, architects, &c., will be invited. All the arrangements are in the hands of Local Committees, who are displaying keen enthusiasm for the scheme.

Optical Convention.—Readers may remember that three years ago a Committee was appointed to secure a guarantee fund and make arrangements for a meeting of the Optical Convention to be held the following year. This duly took place at the Science Museum, South Kensington; and it was supported by 42 contributors of papers, 71 exhibitors in the trade department, and 42 in the loan department of the exhibition. The matter was noticed in the "Journal" for July 2, 1912 (pp. 34, 43). We learn that a meeting of the members will be held in the rooms of the Chemical Society, Burlington House, W., on Thursday evening, under the presidency of Dr. Silvanus P. Thompson, F.R.S., when the General and Finance Committees will present reports on their proceedings; that of the latter Committee being accompanied by the accounts. These show a sum of £6 6s. contributed by the Institution of Gas Engineers. A report will also be received from the Technical Committee and considered. Towards the close of their report, the General Committee recommend that special votes of thanks should be passed to the benefactors and officers, to the President, and to Mr. Walter T. Dunn, the Secretary, who carried through the laborious work connected with the preparations for, and the winding-up of, the convention of 1912.

Professor Bone's Howard Lectures at the Royal Society of Arts.—It has already been announced in the "Journal" that Professor Bone will deliver this month three Howard Lectures on "Surface Combustion," at the Royal Society of Arts. They will commence next Monday evening at eight o'clock, and be continued on the 23rd and 30th inst. In the first lecture, Professor Bone will refer to the early experiments of Sir Humphry Davy, Dulong and Thénard, Döbereiner, William Henry, Thomas Graham, and to the controversy between Faraday and De la Rive in 1834-5. He will then notice the work of Deville on "Dissociation,"—leading to the erroneous notion, upheld by Mr. Friederich Siemens, that hot surfaces hinder combustion—and Mr. Thomas Fletcher's experiments in 1887. The lecture will close with some remarks on the revival of the subject since 1902, modern views of the action of hot surfaces in accelerating chemical changes in gaseous systems, and the factors operative in surface combustion. In the second lecture, the discovery of the phenomenon of "flameless incandescent surface combustion" and processes for applying it industrially will be dealt with; diaphragm heating and its application will be explained; and then attention will be directed to the firing of crucible, muffle, annealing, and forging furnaces on the new principle. In the final lecture, Professor Bone will illustrate surface combustion as applied to steam raising in multitubular boilers.

PERSONAL.

Mr. J. Douglas K. Restler, of the Water-Works Engineer's Office, Batchworth, Rickmansworth, has been transferred from the class of associate member to that of member of the Institution of Civil Engineers.

It was announced in the "Journal" for the 10th ult. that Mr. H. C. Sims, the Chief Accountant of the South Metropolitan Gas Company, was about to retire, after nearly forty-two years' service. He has now done so; and we learn from the current number of the Company's "Co-Partnership Journal" that the vacancy has been filled by the promotion of Mr. Frank Day, who has for rather less than two years held the position of Chief of the Rental Department.

It was mentioned at the recent meetings of the Bournemouth and Croydon Gas Companies that Sir Corbet Woodall had gone to the South of France to recruit his health. Sir Corbet returned home about the middle of last week; and yesterday morning gave evidence on behalf of the Brentford Gas Bill. Those who saw him, and those who heard him, were gratified with the obvious improvement in health. In facing the fire of his cross-examiners, there was all the old customary ease; and by the time Sir Corbet left the witness chair certain Counsel must have felt that, instead of scoring, they had been scored off.

The Margam Urban District Council, Port Talbot, have, out of 112 applicants, appointed Mr. Evan Rees, of the Brynmawr and Blaina Gas Company, to the post of Manager of their new gas-works, which are now in course of erection, and the estimated output of which for the first year is from 40 to 45 million cubic feet. Mr. Rees gained his initial experience at Neath, and was appointed to his present position at Blaina in 1907, when the make was 32 millions, the consumers numbered 932, and the leakage account was 30 per cent. In 1910, he reconstructed the works, from the carbonizing plant to the distributing mains; the producing capacity being 90 million cubic feet per annum. The present make is 48 millions, the consumers number 1964, and the leakage account has been reduced to 16 per cent.

The proceedings of the Water Committee submitted to the Liverpool City Council last week contained a recommendation that, upon the retirement of Mr. Joseph Parry from the position of Water Engineer, on superannuation allowance, he be appointed for a period of not exceeding two years Consulting Water Engineer to the Corporation, at a fee of £300 per annum. Mr. Stephenson moved an amendment that the fee to Mr. Parry be at the rate of 1s. a month. He said he did so because, in order to get round a Standing Order which required officials to retire at 65 years of age, they were making appointments at £300 a year. He claimed that in the Corporation service there were men who ought to be given a chance to rise in their department when senior officers retired. The amendment was only supported by four of the Labour members; and the resolution of the Committee was confirmed.

The current number of the "Co-Partners' Magazine" of the Gas Light and Coke Company contains an account of two presentations to Mr. E. W. Browning, the Inspector-in-Charge of the districts attached to the Westminster office, on the occasion of the completion by him of fifty years' continuous service with the Company. In recognition of this very exceptional record the Directors gave him a gold watch, which was presented by the Governor (Sir Corbet Woodall, D.Sc.) on the 5th ult. On a previous occasion the Controller of Gas Sales (Mr. F. W. Goodenough), on behalf, and in the presence, of a large number of Mr. Browning's colleagues, old and young, asked him to accept a handsome case of cutlery, subscribed for by them, as a token of their affection and esteem. In January, 1907, a Committee of Inspectors-in-Charge was created; and Mr. Browning was nominated the first Chairman by the Controller of Sales. Subsequently the election of Chairman was delegated to the members of the Committee, and they unanimously chose Mr. Browning, who is still Chairman and Secretary. He is a zealous Freemason, and a Life Governor of all three Masonic Benevolent Institutions.

The retirement of Mr. John Parry, the Deputy-Engineer of the Cardiff Gas Company, upon a pension granted by the Directors after 35 years' continuous service, was made the occasion of an interesting presentation. Mr. George Clarry (the General Manager and Secretary) presided over a large and representative gathering of the officials and workmen of the Company, from whom the presentation emanated. Several old employees who had been associated with Mr. Parry since he first joined the Company testified to his kindly disposition and unfailing geniality. On behalf of the official staff, Mr. H. D. Madden (the Engineer), and others, referred to Mr. Parry in terms of the highest esteem. The presentation, which took the form of a handsome canteen of cutlery and silver, was made by Mr. Clarry, who spoke of his long connection with the recipient; and Mr. Parry feelingly responded. Articled to the late Alderman Bowen as far back as the year 1870, Mr. John Parry has spent the greater portion of his subsequent career in the service of the Cardiff Company, having absented himself only for a few years after completing his apprenticeship, to extend his experience of gas engineering under Messrs. Newton, Chambers, and Co., of Sheffield. He returned to Cardiff in 1878 to take up the position of Deputy-Engineer.

OBITUARY.

The death is announced of Mr. Charles N. Brown, J.P., who was well known in connection with the public and commercial life of Yarmouth. Among the various offices he filled was that of Chairman and Secretary of the Gorleston and Southtown Gas Company. He was 57 years of age.

The death occurred last Saturday, at his residence in South Kensington, of Mr. Christopher Clarke Hutchinson, K.C. The deceased was a well-known member of the Parliamentary Bar, and was engaged from time to time in cases reported in our columns. He practised as an engineer in Great Britain and the United States before being called to the Bar at the Middle Temple in 1896. He was a member of the Institution of Civil Engineers, and a Fellow of the Chemical Society and of the Institute of Chemistry.

PRESENTATION TO MR. R. O. PATERSON.

In connection with his retirement from the position of Engineer and General Manager of the Cheltenham Gas Company, Mr. R. O. Paterson has been entertaining the staff and employees at a farewell dinner. As the conditions of work prevented the whole of them being free at one time, the function had to be held on successive evenings. The first gathering took place last Tuesday, when a large party assembled in a spacious room at the gas-works, which was tastefully decorated for the occasion. Mr. Paterson presided.

After the loyal toasts had been honoured, opportunity was taken to make a presentation to the host, which had been enthusiastically subscribed for by all grades of the employees, as well as by the Directors, Auditors, and officials. It took the form of a solid silver tea and coffee service, with tray, bearing a suitable inscription; and it was accompanied by an album containing the following address, with the names of all the contributors:

To Robert Ormiston Paterson, *Esq., C.E.*

We, the undersigned Directors, Auditors, officials, and employees of the Cheltenham Gas Light and Coke Company, desire, upon the occasion of your retirement from the position of Engineer and General Manager, which you have held for over forty-three years, to unite in asking your acceptance of the accompanying silver tea and coffee service as a small token of the esteem, regard, and respect in which you are held by all connected with the Company. We desire also to put on record our deep sense of the unvarying high-minded, consistent, and impartial attitude which has ever marked your conduct in dealing with the affairs of the Company on the one hand and the Company's employees on the other. Unfailing devotion to the best interests of the Company, coupled with consideration, courtesy, and kind thought for the welfare of those under your management, have characterized the whole period of your service. We feel it almost superfluous to testify our appreciation of the success which has marked your career. The history of the Company's operations from the commencement of your management has evidenced one long period of rapid advancement from whatever standpoint it is judged; and the undertaking to-day stands in the front rank of similar enterprises. This, we feel, is the best testimonial, not only to your skill as an engineer, but also to your keen commercial acumen, high principle, and the integrity of character shown in your business relationships. In conclusion, we desire most cordially and sincerely to unite in expressing our earnest wish that your remaining years may be blessed with continued good health and true happiness.

In making the presentation, Mr. Frank Lawson (the Chief Clerk) expressed the esteem and regard in which Mr. Paterson was held, more especially by those who knew him best, and were brought into closest touch with him. The loyalty which had characterized all his work for the Company, and the conscientious fairness which marked his dealings with the men under his charge, were very prominent features of his management. In asking his acceptance of the gift, Mr. Lawson spoke of the spontaneous manner in which it had been subscribed for, from the Chairman down to the humblest employee; and he expressed the earnest desire that Mr. and Mrs. Paterson might be spared many years of retirement, blessed with good health and happiness.

In responding, Mr. Paterson spoke with considerable emotion. He offered his sincere thanks for the gift, as well as for the kind expressions of regard which accompanied it. He said no event in his long connection with the Company had moved him so much or had given him such real pleasure. He took occasion to exhort all present to be zealous in the interests of the Company, and commended to them his son, who, as his successor, would ever seek to act towards them with fairness and consideration.

The remainder of a very happy evening was devoted to music and conviviality.

The late Mr. John Walter Sugg, of Dorking, left estate of the gross value of £46,124. The will of the late Mr. Henry J. Davis has been proved at £28,656.

At next Tuesday's meeting of the Illuminating Engineering Society, a paper will be presented by Mr. W. C. Clinton, on "A Comparison between Illumination Estimates and Performance in Practice."

NOTES FROM WESTMINSTER.

PROVERBIALLY, March is supposed to come in like a lion, and go out like a lamb. Parliamentary Committee work upon Gas Bills has started this session with a perfect storm over one Bill; and the signs are that, instead of following the simile as to the behaviour of the month, there will be sustained vigour the next few weeks, and unflagging interest in Committee proceedings. The Bill that has commenced the session's work is the variegated powers one of the Brentford Gas Company.

The Brentford Bill.

Mr. Honoratus Lloyd, K.C., introduced it to Lord Hylton's Committee last Wednesday; and it was only yesterday that the promoters' case was finished. The Company seem to have been highly successful in getting most of the local authorities, some electricity suppliers, and others up in arms against them. It is quite obvious, from the character of the cross-examination up to the present stage, and from some of the more or less singular—"singular" sounds much better than "foolish"—statements of more or less eminent Counsel, that the local authorities and others sadly require enlightenment on the merits and justice of the proposals of the promoters. The Company are asking for the right to purchase a new site at Chiswick, for gas-works purposes, to take over the Staines and Sunbury Gas Companies, to consolidate capital, to have authority conferred upon them to apply for, or to acquire, Electricity Provisional Orders, and to supply power gas. Up to the close of the sittings on Friday, Mr. Alex. A. Johnston, the Company's Engineer and Manager, and Mr. E. H. Stevenson had been the only two witnesses. But Sir Corbet Woodall, Mr. Henry E. Jones, Mr. Watney (Surveyor), and Mr. W. Cash were mentioned as witnesses who would be called; and their evidence was taken yesterday. It was gathered during the proceedings that Lord Hylton and one of his colleagues made a special survey on Saturday of the 90-acre site that the Company are proposing to take for gas-works purposes.

Wisdom at the Bar.

Mr. Johnston made an excellent witness; and cross-examining Counsel, while they did their best, failed to find any weak spots in his armour. The cross-examination was all interesting, and some of it very amusing. From the opposition point of view, almost everything the Company are proposing is wrong; and instead of benefiting the consumers through broadening, and putting more economy into, the gas service, it is all going to inflict increasing burdens on them. Some reference has already been made to certain curious statements and questions put by opposing Counsel. Out of sympathy, we must only look upon them as mouthpieces of their clients. If they were speaking wholly from their own knowledge and wisdom, they would not have descended to certain of the absurdity put forward. There is the proposed Chiswick works' site—admirable and economical in every way. One learned Counsel (we almost hesitate to say it was Mr. Balfour Browne, K.C.) indirectly suggested that the Company should betake themselves to Barking—far outside their own district. Later on, the vigorous Mr. Stevenson suggested that the view that the Company should transfer manufacture to Barking would only be that of a madman. This may sound unkind, but nevertheless it is the truth. There was another Counsel who suggested that the little reduction that will be made from the present illuminating power of gas at Sunbury to that at Brentford would be equal to the value of 3d. per 1000 cubic feet! No wonder people who knew differently smiled all round that learned Counsel! What matters it to-day, except in regard to a very small percentage of the gas consumed by people who still prefer to live in past times, whether or not the gas has any illuminating power at all so long as the calorific power is about right. Some of the Counsel, too, acting on instructions, are asking for a calorific power test to be applied to the Company, in addition to the illuminating power one. There were other incidents equally amusing to those mentioned. One of the strange features about Committee room proceedings is the opposition of local authorities to prospective local advantage.

Hostility to Local Economy.

There was really no opposition to the proposed amalgamations, save that the authorities in the districts to be annexed want more than the excellent reductions already within sight for the local consumers, while the authorities in the present Brentford area—not looking at the future benefits of an enlarged district for the whole of the Company's consumers—did not want the consumers in the other authorities' areas to get so much as they are to have. The minds of local authorities do not jump together. Then the authorities in the Chiswick area do not wish the Gas Company to have a large concentration of gas-works there, though river frontage and excellent railway communication will produce a saving in the transit costs of material—coal to the works, and the distribution of coke from the works. It is necessary, in the cause of economy, for the Company not to proceed with developments at Southall, as it is an expensive station to run—the cost there being per 1000 cubic feet 1·98d. over the Brentford station; while it is estimated that works at Chiswick can be run at 2·2d. per 1000 cubic feet less. There was the usual talk about district amenities and nuisance; but the value of this sort of thing in opposition has almost died out since the scientific advances of gas-works operations have practically eliminated any bad behaviour. The old arguments were also held up to view, that it is adverse to public interests to entrust gas companies with electric supply powers, and that by doing so a new competition is set up. The Board of Trade (who ought to study the question of local economy) questioned the expediency of gas companies being allowed to acquire electric supply undertakings. But gas companies with their cheap supply of heat and other favourable conditions are now peculiarly well situated for economical electrical generation, distribution, and management, and certainly there is no idea of setting up competition with other suppliers of electrical energy. Then there is the question of the supply of power gas. This was likewise opposed, although the supply of such gas would be of immense advantage to local industries. The absurd suggestion was made that if this gas was supplied, as it would be distributed at a higher pressure than ordinary town gas, it would escape and get into the electric conduits. The electric conduits ought not to permit the gas to enter, and electric current ought not to escape to ignite the gas. There is no more danger with power gas than with other gas; a greater danger is from opposition resulting in the destruction of possible local advantage. Again local authorities are opposing the amendment of the public lighting charge clause of 1868, which was put upon the Company under totally different conditions from those existing to-day. The conditions have changed; and the Company want to emphasize and clearly define the conditions that existed when the clause became law by inserting in it the two words "for lighting." The very existence of the clause is a deterrent to the Company doing all they might in the matter of the cheap supply of gas for power purposes in the day time. Mr. Balfour Browne contended that there was not the slightest reason why the lowest price for any purpose should not be the one that should be maintained for public lighting purposes. The sense of fairness should prevent any such contention; and so should the advantage that the daylight development of business has upon the price of gas for lighting purposes. There is the question of the conversion of capital. Some of the authorities think this will cause some expense to fall upon the consumers. We suppose they refer to the stamp duty. They had better lay their complaint in another quarter; and the Company would then support them. *Per contra*, however, the conversion will produce stock that is more readily placed and dealt in; and with the expansion of gas supply, there will be much capital wanted in the future for works and distribution developments. Anything that will assist in facilitating public investment in stocks of this nature should be welcomed, and not opposed. There is a point about calorific power which is alluded to in our editorial columns.

Gas-Heated Furnaces.

A demonstration and lecture on gas-heated furnaces by Mr. J. Lord, of Manchester, took place last Saturday week, before the Foremen Smiths' Association, at the Glasgow Corporation Gas Department's Workshops, Milan Street. Mr. Lord first gave an interesting demonstration of the different types of gas-furnaces which were suitable for bar-heating, rivet and bolt making, high-speed tools, case-hardening, and annealing, under blast and natural draught. The experiments seemed to be much appreciated by the large audience present; the demonstration lasting about an hour. The company then adjourned to the lecture room. Mr. Lord in the course of his lecture (which was illustrated by lantern slides) said there was a very large field for gas for industrial purposes. He dealt particularly with the carbonization and re-heating of low carbon steel, giving hints as to time and treatment for different percentages of carbon in the steel—this being a vital point in the operation. The types of furnaces for this process were shown; and the lecturer gave details as to their construction, and the points to be observed in the operation and proper working, to give the highest efficiency.

Southern District Association of Gas Engineers and Managers.—The *agenda* for next Thursday's meeting of the Association has now been issued; and the main business is the address of the President, Mr. Thomas Glover, M.Inst.C.E. The other items include the report of the Committee, and a report in regard to the examinations arranged for gas-fitters. Subsequently the members will dine together at the Hotel Cecil.

Coke as Boiler Fuel for Ships.—At the recent annual dinner of the employees of the Wandsworth, Wimbledon, and Epsom Gas Company, of which a short notice appears elsewhere, the Chairman—Mr. H. O. Carr, the Company's Engineer—stated that coke fuel had been tried for driving the *Wandle*, one of their colliers, and the experiment had been attended with excellent results. He said the vessel now steamed at greater speed, and took less coke in tonnage than she used to take in coal; and this was the chief consideration. He believed he was right in saying she was the first boat to be run successfully on coke alone; and this was something of which the Company could be proud. He thought the Directors would probably allow him to fit up the other collier—the *Mitcham*—in exactly the same way; so that the Company would not only be large consumers of their own commodity but would, by the use of smokeless fuel, help to increase the safety of vessels going down the river.

ELECTRICITY SUPPLY MEMORANDA.

The Municipal Home Rule Bill.

The ill-fated Bill of the Incorporated Municipal Electrical Association which has been reposing for the last few years at Westminster, and has only been treated to a brief annual outing, is to undergo revision, and then be again laid in its resting-place. The idea of the revision is to secure the adhesion to the Bill of the Electrical Contractors' Association; the promoting Association having already obtained the adherence of the Electrical Manufacturers' Association, who are not so closely concerned in the matter as the wiring and fittings contractors. The first draft published of the proposed revised measure has been received with a certain amount of gaiety by the contractors, and frankly we are not surprised. If the municipal proprietors think that what they offer should be a satisfactory compromise, then the fresh move is only of a piece with what has gone before, and which has been so unacceptable to the contractors, and, we undertake to say, would have been to Parliament. The revised form shows that the promoters desire to get all they can for the local authorities, in the way of fittings, wiring, and other powers, but they want to give away as little as possible. They have not been diplomatic in endeavouring to tempt the contractors. The Bill only accentuates the fact that the local authorities wish to have the giant's share of everything; while the contractors (if the authorities have their way) must be content with the crumbs—assuming such a Bill could be run through Parliament—that may fall from the local authorities' tables. The revised draft proposes to confer upon electricity supplying local authorities power to provide, sell, let for hire, fix, repair, maintain, and remove electric lines, fittings, apparatus, and appliances for lighting, heating, and motive power, and for all other purposes to which electric energy can, or may, be applied. There is a provision under which any authority "may"—not shall—enter into contracts for carrying out the powers of this part of the Bill. Then there is a provision to the effect that there shall be an adjustment of charges so as to meet in the aggregate any expenditure incurred under the wiring and fittings powers. But in relation to the charges to the consumers, they are to be separately set forth on the demand note, "*unless* such sum is included in the price charged by the undertakers for electricity." In this way, a charge to a consumer can easily be muddled away in that made for electricity.

Sops without Substance.

The clauses to secure the co-operation of the contractors are an attempt to make things look as inviting as they possibly can be by wrapping them up in a gossamer and ludicrous-looking covering. In the first place, the promoters, with great condescension and liberality, propose that the ratepaying contractor shall be given reasonable facilities for taking a ratepaying customer to view the goods at the municipal showrooms, and on any sale made the contractor is to receive a discount by way of commission. It does not require an Act of Parliament to give a ratepayer the right of reasonable entry to a municipal show-room—any more than to a free library and reading-room. There is a very dangerous sub-section, which provides that "any undertakers who pay a commission to the persons employed by them in respect of the sale or the letting of fittings shall pay a commission at the same rate, und under similar conditions, to any electrical contractor upon whose introduction any fittings are sold or let by such contractors." Why on earth anyone in the employ of a local authority should receive a commission on anything sold upon the introduction of a contractor is something we do not understand. As ratepayers, we should have a strong objection on principle to commissions being paid to public employees, who ought to be sufficiently recompensed, and stimulated by that recompense and sense of duty, without being paid commissions. Further the goods sold ought not to be at a price that will stand double commission, and a bit of profit as well to the electricity undertaking. Really, the further we examine these clauses, the more stupid they appear. The contractors have not shown themselves foolish in the past in this matter of municipal trading in electric fittings and wiring; but if they accept any compromise on the lines of this revised draft, in view of the strong position they occupy in Parliament and legally, they will be their own worst enemies. Note this as a protective clause for the contractors: "Undertakers shall not, in the exercise of the powers of this section, sell any fittings at a less price than the price (if any) which is determined and enforced by the makers of such fittings as the minimum price for the sale thereof to the class of consumer to whom such fittings are sold." In other words, if the maker does not name a minimum price at which fittings may be sold (which a maker does not often do), then the authority selling the goods will have no restriction placed upon them. It is also proposed that the authority shall not themselves execute the wiring of private property except between the main and the consumers' meters, but they may enter into contracts for the execution of the work, so long as they do not show undue preference to any contractor. "Private property" requires definition, as some of the wiring and fitting plums are not describable as "private property." Who, too, is to be the arbiter as to what is "undue preference?" This is only a draft of the revised measure; whether any improvement will be effected before the Bill assumes the general form in which it will be presented to Parliament, cannot be said. But at the present time, as a suggested compromise, the draft is about as feeble and as laughable a thing as could possibly have been produced. The promoters should have another shot, even if only to save their own dignity. There are to be other clauses in the Bill; but they are much the same as in the previous abortive measure of the Municipal Electrical Association.

Mr. Grogan Again.

We have just been reading the lecture with which Mr. F. S. Grogan recently regaled the Wolverhampton and District Engineering Society. If the members of the Society had known peripatetic Mr. Grogan as long as we have done, and the composition of his lectures, they would have been aware that what he had to say, as the missionary in "Tricity" cooker trading enterprise, is somewhat stale. It is the old tale in relation to comparative virtues that he declines to defend by public tests, and a public examination of his authority for many of the statements he takes from stock on these occasions. We once offered, if Mr. Grogan would muster up courage to have a public contest, to have all the standard apparatus present for him to take gas pressures, calorific power, tests of what he is pleased to call "fumes" and "foul gases," and a meter whose accuracy is above suspicion, so as to permit him to prove his personal authority for making the assertions in question. But he would not. It was our loss; for we were at the time hoping very ardently for a little excitement at the expense of Mr. Grogan. In his Wolverhampton lecture, he states that "not only does the calorific value of gas vary, but the pressure of supply varies by hundreds per cent., especially in different parts of the town." The inferences intended to be drawn from this are untrue. By how much per cent. we wonder does he think that the calorific power of the gas supply of any town varies from hour to hour, and by how much does he imagine that such percentage variation affects temperature efficiency! The same with differences of pressure. The normal differences have no material effect upon flame temperature, which is the important thing. A very learned disquisition (largely copied), forming part of the lecture, dealt with the constitution of meat, and with the reasons why it is bound to shrink a bit in cooking, and why it should not shrink more than can be avoided in order to retain the essentials. In passing, Mr. Grogan told his audience the old yarn about electrically cooked meat only shrinking 10 to 12 per cent., while the loss due to other methods is as much as 25 to 33 per cent. Our volatile friend knows that, with heat obtained from any source, if care is not exercised variable results can be obtained with the food cooked; and so he hastened to qualify what he had already said by the remark: "I have cooked meat with similar savings in weights in the older methods, but only with a vast amount of care and trouble which none of you dare to expect from the present-day cook." The form taken by that "vast amount of care" is not stated; but it shows that even Mr. Grogan, supersaturated as he is for commercial purposes by electrical cookery, acknowledges that gas can cook with as little waste in weight as electricity—quite apart from the question of what is the character of the waste. But our friend ought to have presented the members of the Wolverhampton and District Engineering Society with an electric cookery book, which would have told them of the extraordinary care that has to be exercised in electric cooking, by the use of thermometers, glazed sight-holes in the oven doors and interior electric lamps, in order—at least that is the intention so long as the glass is not covered with greasy vapour—to preserve temperatures, and not allow any of the precious heat to escape from the electric-oven through the opening of the door to examine the food. The other half of the electric tale was not told in this Wolverhapton lecture.

Shrinkages and Efficiencies.

Mr. Grogan speaks of evaporation from meat during the baking process. Through the ages of cooking, the experts have advised the use of a high temperature when baking starts, in order to coagulate the exterior of the joint, and so prevent the juices from escaping. But Mr. Grogan now comes along and, in the interests of electric cooking, preaches the reverse condition. If the surface becomes dried up, he declares, it allows the inner juices to ooze out, carrying with them the valuable extractions and the salts. We rather incline to the view that the flabby open exterior of joints when steamed at low temperatures in the electric-oven is the cause of so much rich liquid escaping from them. Mr. Grogan is also an authority on heat. He says that the majority of heat in a coal fire oven is "radiant" heat. We have looked into a coal-fire oven, and fail to find anything of a very "radiant" nature there. We hope his audience did not show any discourtesy by laughing. Later on, he deals with efficiencies, and asserts that a gas-oven has only an efficiency in practice of 15 per cent., while an electric oven has 80 per cent. He has never answered our question of long ago, as to what he means by "efficiency in practice," nor has he ever told us how he arrives at these efficiencies. We take a dinner which required 3 units of electricity to cook it, or an expenditure of 10,260 B.Th.U. (with a small quantity of water heated); and then a dinner comparable in all respects which took 25 cubic feet of gas (taking the round figure of 500 B.Th.U. per foot) to cook with the type of oven used, which was equal to 12,500 B.Th.U.—the electricity costing 3d., gas less than 1d. Does this show

Mr. Grogan's difference in "efficiency in practice?" Let us look another way at the 80 per cent. efficiency for the electric-oven and the 15 per cent. for the gas-oven. Three units of electricity are equal to 10,260 B.Th.U.; and 80 per cent. of this would equal 8208 B.Th.U. Now if a gas-oven has only a practical thermal efficiency of 15 per cent. (which is equal to 75 B.Th.U. per cubic foot of gas consumed), to get the work done that is performed by the 8208 B.Th.U. in the electric-oven, no less than 109 cubic feet of gas would have to be consumed. Mr. Grogan will permit us to have our own private views on his assertions and knowledge as to practical heat efficiencies. But why did he not deal fully and with perfect candour with the electric hot-plates, and cooking other than in the oven, and show the relative capabilities in these respects? Slow and wasteful are the electric hot-plates; troublesome is electrical operation; and we know of "Tricity" cookers that have been replaced in the domestic system by gas-cookers, which, with their simplicity and reliability, are much preferred. These are reasons, among several others, why electric cooking is not "winning."

The "Fat" that Paid the Bill.

A short time ago the electrical papers were talking at random about the adoption of an electric-grill at Romano's Restaurant in the Strand, and they came to a perfectly unanimous conclusion that the working of the grill was so much cheaper than gas and coke, because of the great and profitable saving of fat. In other words, the liquefaction of the fat of the meat was so considerable that its value was sufficient to pay for the provision of the electric heat for the grill, and to have something in hand. Now it is very wrong of any electric grill to sweat meat in this barbarous fashion, because it is electrically held as a virtue of electric cooking that its meat shrinking propensity is almost *nil*. But the fact remains that, during the short period of 55 days' operation, the electric grill is credited with having extracted from the meat exposed to its untender mercies no less than £11 worth of fat. It is not stated whether the gentleman who assessed the value of the fat at 8d. per lb. allowed something for the nutritious qualities of the meat which must have escaped with the fat, and which, according to electric theory, should, under any form of electric cooking and no other, find its way into the stomachs of the people who indulge in electric cookery. However, this wonderful fat has an estimated value greater than the electric current consumed during the 55 days' test. This amounted to 1861 units at 1d. (£7 15s. 1d.), the standing charges £2 11s. 8d. [*phew!*], and the meter-rent (4s. 4d.), which, combined, total to £10 11s. 1d. The reason this "fat" of high market value is saved is that the active part of the grilling apparatus is placed above the food cooked, a sloping tray is placed underneath, and a trough carries the fat to a hole which communicates with a collecting chamber below. How marvellous! What a great achievement!! A grill heated by gas above the food has never been heard of by our electrical friends; a tray that collects the fat in much the same way has never been heard of. No? We really wonder they did not ask themselves how gas finds its way out of burners clogged up by the fat that it is insinuated, if not deliberately said, drops on to gas-burners and is destroyed. But we see it is stated that in the grilling "gas and coke" were formerly used—the suggestion being from the manner of statement that gas had precedence in quantity and use over the coke. Naturally, if a coke fire is used with the grill above, a proportion of the fat not collected in the channels of the grill would be wasted; and we should assume that some very wasteful form of grill was used that requires, as in the "Electrician" story, "0 0 0" placed under the £ *s. d.*, with the words attached "Deduct revenue from fat, &c." The charge for "fuel and gas" for 55 days is put down at 4s. a day—totalling £11. How the 4s. was arrived at is not stated; nor is the proportion between gas and coke mentioned. However, if the cost of electric current, standing charges, and meter-rent, is deducted from the revenue from 4 lbs. of fat per day at 8d. per lb. (£11), a profit is shown of 8s. 11d. Now perhaps our electrical friends will compare the operation of this electric grill with an all-gas grill heated from above the food, and not indulge in such foolish comparisons for the purpose of disparaging gas without cause. Examining the matter from the electrical theoretical standpoint, an investigation might be made to ascertain how much extra meat had to be purchased through the furious manner in which the electric grill went to work, and caused the exudation of 220 lbs. of "fat" in 55 days. Until Professor W. A. Bone referred to the comparison, in his Royal Institution lecture (as reported last week), we had forgotten that this fresh piece of absurdity had not been commented on in the "Memoranda." However, if it is not the saving in "meat" and the retention of the nutritious qualities of the meat within itself then it is the marketable value of the mixed fat and best virtues, of the meat that make electric cooking such an economical procedure. The electrical sophist is not to be excelled.

The "New" Fertilizer.

Electrical engineers are rather late in offering practical assistance to agriculturists. It has been noted before that the former have their eyes partially turned in the direction of the gas industry for the cheap supply of gaseous fuel for generating current, and partially to the generation of gas themselves in producers, with ammonia recovery. Some engineers are looking one way, some another; and it seems as though eventually it will rest with the gas industry to say whether or not it can supply gas at a rate which will make unnecessary the addition of gas and sulphate of ammonia production to the operations of the electricity generating station. The troubles and anxieties that devolve upon the electrical engineer and manager are in all conscience oftentimes almost heart-breaking, without adding to the burden of responsibility. However, on the subject of sulphate of ammonia production by electricity stations, a report of the speeches made after the recent annual dinner of the Yorkshire Section of the Institution of Electrical Engineers supplies interest. The Chairman was Mr. W. B. Woodhouse; and if the words are correctly reported that he used in proposing "Our Guests," he seems to have entirely ignored the fact that the gas industry has, for a great number of years, been supplying the agriculturists of this country and abroad with sulphate of ammonia for fertilizing purposes. In fact, he told the agriculturists to look hopefully to the chemist and the electrical engineer to supply them with their needs for fertilizing the earth. The gas engineer was there first, by a long way; the electricity industry has one small contributor at Accrington to the 420,000 tons of sulphate of ammonia produced in the United Kingdom! This annual production has been progressively built up over a long period. But Mr. Woodhouse is evidently labouring under the impression that it is all new. The report before us accuses him of saying: "Up to the present, agriculture could hardly be said to have benefited from the coal industry; but *now* they saw that coal was not only fuel, but *might be* used as a very valuable fertilizer. The "now" and the "might be" deserve emphasis, when the records in our possession of prices paid to the gas industry for the fertilizer go back to 1867. Another interesting sentence in the report is that farmers must look to getting something more per acre than before; and they could do it with the aid of the chemist and the electrical engineer. Mr. Woodhouse might have had the courtesy to let the gas engineer have at any rate just a little look in. But perhaps he was not correctly reported. If he was, then "The Times" knows more about the matter than he does; for, in recently discussing the question of the cheapening of electrical energy, it is indicated that one way in which this might be done is by getting something more out of the coal than the electrical energy—the writer adding that "it is notoriously by a method of this kind that abundant prosperity has been brought to the gas industry." Of course, it is also notoriously by other things as well. It is by the diversified character of the business engaged in by the gas industry that its prosperity has been attained and maintained.

Over-Production, or What?

In the "Daily Telegraph" on Monday last week, this advertisement appeared: "About 1,000,000 Ductile Wolfram Filaments for Incandescent Electric Lamps For Sale Very Cheap. Offers to J. N. 13,862, care of Rudolf Mosse, Annoncen-Expedition, Berlin, S.W." [If Herr Mosse does not ask for an account for the advertisement we are giving him, we shall not trouble him with one.] It will be noticed that these homeless million filaments are going "very cheap." It seems very much like a case of over-production of filaments, or a false estimate in attempting to gauge the absorptive power of the market. It is a pity that the million should be going "very cheap;" and for the sake of Herr Mosse's client we hope he will succeed in landing them upon the English market, as Germany does not seem to have any use for them.

CYANIDE OR SULPHATE?

It is well known that, in addition to nitrogen in the form of ammonia, crude coal gas contains a smaller, but yet considerable, quantity of nitrogen combined in the form of cyanide. For many years this nitrogen was allowed to go to waste in all gas-works. It was, indeed, absorbed by the lime, wherever lime was in use as a purifying material; and where oxide alone was employed a large proportion of it was retained by the oxide. But no successful process has ever been devised for the recovery of cyanide from spent gas lime; and it was not until about thirty years ago that cyanide was at all commonly recovered from spent oxide, and then principally in Germany.

The systematic extraction and utilization of cyanide from coal gas dates from the early nineties, when a modification of Rowland's process of washing the crude gas before the extraction of ammonia with an iron salt in solution or suspension in water was carried out at Beckton on a large scale. Other washing processes, such as that of Foulis, were shortly afterwards adopted at other large works; and, owing to the great demand for cyanide for use in extracting gold from its ores and the comparatively small supply from other sources, the gas-works which first adopted wet processes of cyanide extraction found them a very valuable source of revenue. But with the increase in the number of cyanide recovery plants, the supply of cyanide grew at a greater pace than the demand, and its price fell away until the recovery processes which involved high working expenses ceased to be carried on at a profit. It became clear that the world's requirements of cyanide were limited, and that the cyanide in the world's production of coal gas was in excess of the requirements, even if no account was taken of other sources of cyanide. The general recognition of this fact prevented the majority of the smaller gas-works from introducing

cyanide recovery plant; and thus the larger works have continued to find cyanide recovery worth pursuit.

But the cyanide in coal gas is of interest to the smaller as well as the larger gas-works as a potential source of ammonia. Taking the cyanide in crude coal gas as equivalent in amount on the average to one grain of hydrocyanic acid per cubic foot, and the make of gas at 12,000 cubic feet per ton, the nitrogen of the cyanide will suffice to produce either 4·45 lbs. of crystallized yellow prussiate of potash, or 5·1 lbs. of crystallized sodium ferrocyanide, or 4·2 lbs. of sulphate of ammonia. Now if these products are regarded as valuable only on account of the nitrogen which they contain, the price of yellow prussiate of potash, which corresponds with sulphate at £13 a ton, is about 1¼d. per lb., and of sodium ferrocyanide 1⅛d. per lb.

On the face of it, therefore, it should pay to produce the latter products rather than sulphate from the cyanide in coal gas so long as they will fetch (say) more than 1¼d. per lb. But the iron and potash or soda which are combined with the cyanogen in these products are costly ingredients as compared with the sulphuric acid which is in combination with the ammonia in sulphate. It may therefore be a commercial proposition to extract the cyanide from coal gas, convert it to ammonia, and fix the latter as sulphate, even when the market price of prussiate is very much higher than 1¼d. per lb. Further, for the smaller gas-works there is the attraction in this proposition that it does not introduce the manufacture of a new product, but merely increases their output of sulphate, with which, in respect of both manufacture and market vicissitudes, gas managers are familiar.

For those works which have not hitherto extracted cyanide, the bait of an increase of 4 lbs. per ton of coal carbonized in the output of sulphate is undoubtedly tempting. It must be remembered, however, that the conversion of the cyanide to ammonia has first to be effected; and the economics of the process by which it is proposed to do this should be carefully studied. Until recently the reverse process presented a more attractive field of operations for technical chemists, and many schemes were tried, with more or less successful results, for the conversion of ammonia to cyanide. It was probably owing to these schemes that the price of cyanide did not soar still higher in the nineties.

Technical chemists have now, however, turned their attention to extracting the cyanide from coal gas by methods which will facilitate the conversion of the cyanide to ammonia, which is in turn to be fixed as sulphate. The extraction of the cyanide from the gas will, in general, be by the polysulphide method of the British Cyanide Company, or a modification thereof, such as that introduced by Mr. P. E. Williams at Poplar. The problem of the conversion of the sulphocyanide so obtained to ammonia is that which is now awaiting solution by a process which involves only small working expenses.

Another interesting departure is reflected in a patent taken out jointly by the South Metropolitan Gas Company, a German firm, and a French firm, for the "Manufacture of Hydrocyanic Acid." The process takes the sludge obtained in the Beckton ferrous sulphate washers, boils it with lime, and treats the solution of calcium ferrocyanide thus obtained with an ammonia salt which precipitates calcium ammonium ferrocyanide, which, on boiling with dilute sulphuric acid, yields pure hydrocyanic or prussic acid. The advantage of the process as carried out under the patent lies in the ease with which the filtration and washing-out can be effected and a pure product readily obtained. It does not claim to utilize any reaction which has not been previously well known, but combines known processes in a novel manner which presents practical advantages. It does not seem likely, however, that this process could be utilized on a commercial scale for extracting cyanide from coal gas with a view to its ultimate conversion to ammonia. Its scope appears to lie rather in the production of pure potassium or sodium cyanide from the hydrocyanic acid.

Mr. George Herbert Lloyd, who, up to 1907, was a Director of Messrs. Thomas Piggott and Co., Limited, of Birmingham, and whose death at Eastbourne on the 7th of January was announced in the "JOURNAL" the following Tuesday, left estate of the gross value of £14,998, of which £14,824 is net personalty.

Messrs. Bemrose and Sons, Limited, of Derby, have sent us, at the request of the Nottingham Chamber of Commerce, a copy of the first issue of their year book. A twofold object is sought to be accomplished by its publication—viz., to supply traders in all parts of the world with brief particulars of the manifold industrial resources of Nottingham and district, and to furnish the members of the Chamber, in a brief, compendious form, with useful information which has been drawn from original sources, and is brought up to date. Particulars are given of the gas, electricity, and water undertakings of the Corporation; and the amount contributed by the first-named service is strikingly shown diagrammatically. From £27,000 in 1905, it rose to £39,000 in 1912; while the price of gas has been reduced from 2s. 6·91d. in 1904 to 2s. 5·06d. last year. The total quantity of water distributed in the year ended March, 1913, was 2,801,409,150 gallons; being an average of more than 7½ million gallons per day. About 10⅓ gallons per head per day was used for domestic purposes, and about 10 gallons for trades. Water is supplied practically at cost price; no contribution to the relief of the rates being at present derived from the undertaking. A large and useful section of the book is the classified trade index in English, French, German, and Spanish.

NOTES FROM ABROAD.

Next Meeting of the Société Technique.

The next annual meeting of the Société Technique du Gaz en France will be held in Paris on the 16th of June and following days, under the presidency of M. Auguste Boutan, the Managing-Director of the Lyons Gas Company. It is probable that the meeting will be followed by a visit to the Lyons Exhibition. It is unfortunate that the date again clashes with that of the meeting of the Institution of Gas Engineers.

New York Lighting.

On Feb. 11 a joint meeting was held of the New York Section of the Illuminating Engineering Society and the Municipal Art Society of New York. Mr. Williams, in the course of an address on street lighting, gave the lighting bill of New York for 1912 as follows: Gas, £216,131; electricity, £458,672; naphtha, £10,652.

Large Steel Water-Tower.

The steel water-tower used in connection with the city water-works system of St. Thomas, Ontario, for the purpose of equalizing the pressure and supplying water in case of a breakdown in the pumps or mains, has just been completed at a cost of $25,000. It is stated to be the largest steel structure of its kind in Canada, and the second largest in America, having a height of 144 feet and a capacity of 500,000 gallons.

Gas-Fires in Vienna.

The number of "Wasser und Gas" for March 1 states that the knowledge of the advantages of gas heating—especially its ever-readiness and its freedom from dirt and smoke—is becoming increasingly evident in Vienna. Even if the number of gas-fires installed in Vienna were only a fraction of those added in other large cities (in London, they say, over 100,000 are fitted yearly), it is more than probable that heating with coal, which is to be avoided on grounds of health, will soon be displaced by gas heating. With this end in view, the Vienna Municipal Gas-Works were offering gas for heating purposes at 15 per cent. reduction off the flat-rate obtained by consumers who claim it.

Natural Gas in Canada.

Remarkable progress is reported for 1913 by the Canadian Western Natural Gas, Light, Heat, and Power Company. The daily consumption amounts to some 26 million cubic feet, which is paid for at the rate of 15 c. (7½d.) per 1000 cubic feet. The distribution system has a capacity of 33 million cubic feet daily, but enlargements are in contemplation, since some 500 consumers are being added monthly. The pressure in the borings is over 600 lbs. per square inch, and this is practically as great as when the first well was started. It may therefore be assumed that the supply will last some years. The total capital outlay of the Company at the end of 1913 amounted to more than $9,747,000.

The Munich Exhibition.

It is aimed at making the gas exhibition at Munich this year as completely representative of all branches of the industry as possible, and the announcement has been received with great satisfaction by the authorities that the Society which represents the commercial men of the industry has offered its assistance. Thus the general public will have an opportunity of studying the "office" work of the industry as well as the gas-making and practical side. It is intended to illustrate gas-works book-keeping, office fitting, propaganda work, &c., and this should greatly add to the interest of the exhibition as representative of the whole industry, and among other things afford foreigners an opportunity of studying German methods in this important department.

A Gas Success in Germany.

A notable success for gas is reported from Geisenheim, a small town of some 4000 inhabitants in the Rhine district, which up to October of last year had been for ten years subject to an electricity monopoly. The Municipality then began to supply gas, and there are already 458 houses, or over 80 per cent. of the total, joined to the gas supply. Connections are made free, on condition that at least one two-flame cooker and one lighting burner are fixed. Gas is used for lighting to about the same amount as for cooking and heating; there having previously been many complaints about bad lighting and breakdowns.

Gas-Radiators in Paris.

In view of the extension of heating apartments by gas in Paris, the Gas Company have been pushing the introduction of radiators on hire. They are fixed without any cost to the consumers, who are charged only 5d. per month for their use. At the close of 1912, the Company had been authorized to purchase 5000 radiators; and the placing of them in the winter of 1912-13 was attended by results so satisfactory that nearly the whole of them were brought into operation. This was very encouraging; and the Company were accordingly granted permission to develop this branch of their business, and purchase an additional 5000 radiators for the winter season now drawing to a close. The success of the Company's efforts is shown by the fact that during

September and October last more than 2500 radiators were installed; and they return about 32s. each per annum.

Belgian Gas Industry.

The February number of the Bulletin of the Belgian Gas Association contains a complete list of all the towns and communes in the country which are favoured with a gas supply. In all there are 368, of various sizes, which possess between them 84 separate gas-works. These are in the hands of 27 companies, 14 municipalities, and 2 private concessionaries. Many of these companies supply electricity at the same time. Following the list of the communes, with the number of inhabitants of each and the name of the gas-supplying company or municipality, are some general details of each of the companies—such as the works belonging to each, addresses of offices and showrooms, names of officers, &c. These lists should prove of great value to those who are interested in Belgian gas undertakings, and we believe that hitherto such a directory for Belgium has been wanting.

Dry Distillation of Coal.

M. Bernhard Ludwig has taken out a French patent [No. 462,024 of 1913] for a process and apparatus for the dry distillation of coal or other products. According to an abstract of the specification which appears in the current number of the "Journal of the Society of Chemical Industry," the coal is heated in small inclined retorts in thin layers which are renewed at frequent intervals. It is fed in through a vertical conduit near the upper end of the retort. After carbonization, the coke is moved down the retort by a ram to a zone which is cooled by the circulation of air in flues around it; the air serving afterwards for combustion. From the cooling zone, the coke is discharged over a still into a chamber common to a series of retorts, whence it can be removed in bulk. Gas outlets are provided both at the lower and the upper end of the distillation zone.

Tar and Benzol Prices.

In the course of an article on the value of tar and its products in the "Journal für Gasbeleuchtung" appears a diagram (drawn up by Professor Dr. Ost) showing the remarkable fluctuations in the prices of tar and benzol between the years 1880 and 1905. The price of a ton of tar in 1880 was about 30 marks; in 1883 it had risen to 55; in 1887 it was down to about 16; in 1892 it was up to 40 again; from 1889 to 1905 it was round about 20 marks. The variations in the benzol curve are even more remarkable. Between 1885 and 1886 the price of 100 kg. dropped from 400 marks to 40, owing to the advent of benzol washing in coke-oven practice. In 1890 it again rose to 110 marks; in 1895 it was below 27; and, in the next year it shot up to 75 again. From 1899 to 1905 it was fairly steady round about 20 marks. The prices in the London market last week were about 32 marks per ton of tar, and 27 to 28 marks per 100 kg. for benzol.

Paying for Unconsumed Gas.

In Ludwigshafen (Germany) there is a minimum amount of gas fixed, for which each consumer must pay even if he does not use so much. Recently a consumer refused payment of the sum demanded for the half year, and took the case to the Courts, where, however, the verdict went against him. The Court decided, with evident justice, that the mere fact of taking a gas supply in this instance implied an obligation to pay for the fixed minimum. If any man objects, he can have the gas-fittings removed, and light and cook by electricity, spirit, or oil, so that there could be no question of monopoly. The money received by the gas-works in excess of gas consumed was to pay for the control and reading of meters, and for the harm that might be done to fittings by their being out of use.

Mercury Vapour for Generating Power.

Experiments are being carried out by Mr. W. L. R. Emmet, the Consulting Engineer to an American Electric Company, with turbines, using mercury vapour in place of steam. It is stated that he believes that by its use the capacity of existing power plants can be increased as much as 65 per cent., with a gain of 40 per cent. in output per pound of coal. The mercury is vaporized at 677° Fahr. in a boiler of special design, from which it passes, at a little above atmospheric pressure, to the nozzles of the turbine. Upon leaving the turbine it goes to a condenser, and its heat is imparted to water from which the steam can be used for other power purposes. The condensed mercury is then returned to the vaporizer by gravity, and the cycle repeated. The scheme gives steam power as a bye-product of the turbine.

Removing Lead from Water.

In an article by Herr P. Schmidt in the "Chem. Zentr." [Vol. II., 1258], he pointed out that the lead contained in tap water is present as hydroxide, or basic carbonate, in the form of a colloidal solution. Standing for a few days in tall cylinders, the upper layers of water are found to be richer in lead. In the case of water which has been boiled for a long time, the lower layers become richer in lead on standing. On the dialysis of water containing lead, no lead can be found in the outer water, even in the presence of an excess of carbon dioxide. In accord with these facts, showing that lead is present in the form of colloidal solution, it has been found that the lead can be completely removed by passing the water through a Berkefeld filter, or through a rapid filter of porous porcelain.

A HACKNEY GAS EXHIBIT.

During the first part of last week, and the last part of the week before, there was held in the King's Hall at Hackney a Trades and Industries Exhibition, organized by the "Hackney Spectator." Situated in a well-populated district, and the condition of admission being merely the handing over of 3d., or the production of a copy of the "Spectator," there was every prospect that the attendance would be large; and, if so, an excellent opportunity presented itself for bringing gas and gas appliances to the front—or, perhaps, "keeping" them to the front is a better expression.

Yesterday week, at any rate, when the writer visited King's Hall, the attendance must have been equal to the most sanguine anticipations; and this being the case, it was satisfactory to note that the Gaslight and Coke Company had made the most of the occasion. In fact, gas played a very prominent part in the show. The Monday was announced as the "Gas Company's Grand Night," when the Gaslight and Coke Company's famous Kilburn Band would give a special performance—and a very good performance it proved to be. But the success of gas did not end with the Company's stand (and band); for, although Hackney enjoys the advantages of a municipal electricity supply, and electric lights are in the hall roof, every stall was found to be individually lighted by gas. This was an achievement on the part of the Company which merits a word of congratulation. For this "outside" lighting of the stalls, about fifty lamps, comprising half-a-dozen different patterns, were employed, so as to demonstrate the ability of gas to meet various tastes and requirements in the matter of shop lighting. The illumination in every case was first rate; but so that this remark may not be put down to bias on our part, let us repeat what the "Hackney Spectator" had to say on the subject: "The place is a positive blaze of light; the Gaslight and Coke Company extending themselves to the utmost. From their beautiful stall, the whole of the lighting arrangements of the exhibition have been controlled; and it must be admitted that they have succeeded to an unexpected degree." Equally eulogistic remarks regarding the show were, we are informed, made by the Mayor (Mr. C. Winkley), when opening the exhibition. On the occasion of the last exhibition of the series, which was held three years ago, electricity was to be seen on all the stands; and it is safe to say that nothing was done then which the Gas Company have not proved able at least to equal—even to the rapidity with which the installation was carried out.

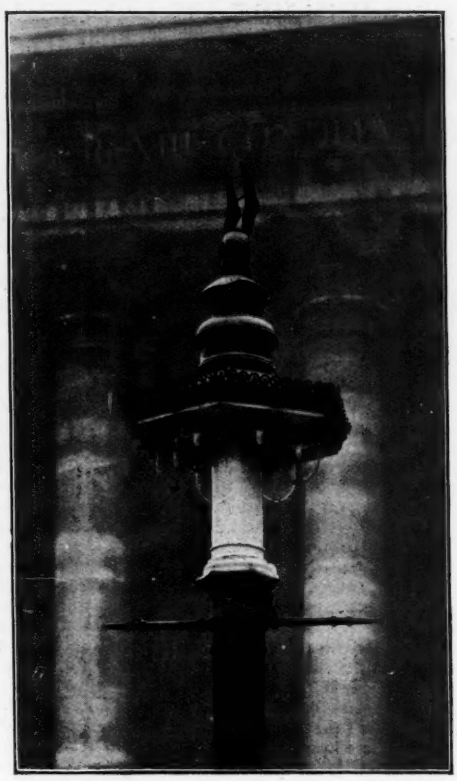
Situated in the centre of the hall, as it was, no one could fail to see the stand of the Gaslight and Coke Company, and to be impressed by the display made at it. The passage-ways round permitted all four sides of the square to be examined easily and completely. One side was fitted up as a drawing-room, with candle-burners, floor lamp, and gas-fire, all connected. Walking round to the kitchen, there was noted a "Gilled" circulator connected to a hot-water tank, and a gas-cooker fitted in a recess. In the bath-room there were a "Victor" boiler and a "New Treasure" geyser in action; and by means of a pump, the water drawn off could be sent back into the tank ready for the next demonstration. The remaining side was fitted up as an office, with a desk light and overhead illumination. The different lights referred to were connected with switches—the action of which Mr. Horatio Bottomley was noticed to be examining with considerable interest while the writer was jotting down the details of the exhibit. Outside lamps were shown of the types which can be hired from the Company—the makers including Sugg, Podmore, Smiths, and Kempton. A very attractive feature was a row, right round it, of "Nico" bijou burners, attached to flexible tubes, and provided with silk handkerchief shades, in different colours, which gave an exceedingly bright appearance to the stand. Another thing which caught the eye—which is just what an illuminated sign should do—was an enamelled iron plate, with clear glass marbles let into it to form the name of the Company, and behind these a row of reflector lights—a thoroughly pleasing effect.

OUTSIDE VENTILATING LAMPS.

Some Fine Specimens in London.

Visitors to the City will have been impressed by the appearance of some fine examples of column-type ventilating lamps recently fixed outside the Royal Exchange, and also in Eastcheap. The lighting effect from these lamps is greatly enhanced by the large amount of white enamelled reflecting surface provided. The upper part of the lamps is white enamel, as far down as the flange (as will be seen from the photograph next page); and this feature provides a very pleasing effect.

The lamps are of the well-known high-pressure type manufactured by the James Keith and Blackman Company, Limited, and were supplied through the Gas Light and Coke Company to the City Corporation. They are served by gas drawn from the adjacent high-pressure main. There are to each lamp six burners of 500-candle power—a total of 3000-candle power per lamp. Each burner is provided with a separate injector, and is, in fact, a complete lamp in itself. The products of combustion are led into the ventilating shaft, and so assist in creating a draught.



Keith Ventilating Lamps in the City.

The control of lighting and extinguishing is effected by means of a single governed flashing bye-pass cock fixed on the column. By this arrangement all the burners are lit and extinguished simultaneously, and with the minimum amount of labour. In addition, each burner is provided with a separate cock, so that in the event of any one getting out of order it may be shut off without interfering with the remaining burners. The globes are all hinged separately, and may be swung down and removed in the usual manner for cleaning purposes.

WORKS TOPICS—XXIII.

By "Modus Operandi."

Two-Shift System.

The informal discussion opened by Mr. W. H. Adams, of Bilston, at the Midland Association meeting, on "Coal and Coke-Handling Machinery as Applied to Horizontal Retorts," makes very interesting reading. He stated that at Bilston they worked two 8-hour shifts—6 to 2 in the morning and 6 to 2 at night—with 8 cwt. charges per retort worked off in eight hours. It is not, however, clear how such a method can be adopted satisfactorily, for the retorts charged between 6 and 10 o'clock, morniug and night, cannot be discharged when due. As a matter of fact, none of the charges can, if worked in their proper order, be discharged in eight hours. It would appear that the retorts are actually charged for eight hours, but are discharged every twelve hours. If this be so, it is open to a good deal of criticism. In such a case, the retort would be doing useful work during 16 only of the 24 hours; whereas with 12-hour charges the same retorts would carbonize 50 per cent. more coal at very little extra cost.

In quite a number of works two eight-hour shifts are worked; but, so far as I know, the retorts are invariably charged for twelve hours, which system lends itself admirably to such an arrangement. Quite recently in this column was described a method of working a small retort-house with machinery and 12-hour charges, whereby two 4-hour shifts can be adopted with one gang of men. The only point to be particularly watched in such a case is the proper mixing of the gas in the holders. Perhaps I misunderstand Mr. Adams's method of working, in which case I should be obliged if he would make this clear.

Coke-Handling Plant.

Several most interesting systems of handing coke were described —notably the Coventry method adopted by Mr. Fletcher W. Stevenson. This arrangement was, I think I am right in saying, first introduced by Sir George Livesey at the Old Kent Road works of the South Metropolitan Gas Company, and also at the South Suburban Gas-Works. It consists of coke trucks hauled by a wire rope along the retort-house and up an inclined gantry to the coke-store. Mr. Stevenson makes it clear that this system, both from the point of view of efficiency and economy in working, has a great deal to recommend it.

The idea of fixing in stage-floor retort-houses special quenching hoppers under each setting to receive the coke on its discharge, is quite a good one. It enables the stokers to complete the work on the stage before going down to the lower floor to remove the coke, which is, of course, quenched, usually by sprays, immediately after its discharge. By this means, too, the coke, if dropped into truck or barrow from the hopper, can be tipped in the coke-store without being again handled. If coke be discharged direct into truck or barrow and quenched there, it is impossible to thoroughly do this without again tipping it out for re-quenching.

By using hoppers, as at Bilston and Coventry, it is possible first to quench the coke, and then to drop it into trucks for removal to the coke-store without having to handle it at all. The method, though rarely seen in use, is undoubtedly to be commended; for it lends itself to the economical handling of coke—always a difficult proposition. It is true that Mr. Copp, of West Bromwich, stated that he had tried these hoppers but had discarded them, owing to the difficulty in completely quenching the coke. Why this should be so is not clear; for, given a good arrangement, the quenching should be quite adequate, more especially as a second quenching could always be applied, if necessary, as the coke fell from the hopper into the truck. At any rate, it should be at least as easy to quench coke properly with this method in use as with hot-coke conveyors.

Accident Prevention.

Many engineers will no doubt have noticed Mr. Carpenter's reference, in his speech at the South Metropolitan Gas Company's meeting, to the diminution of accidents brought about in his Company during the past 16 years. The reduction from 8·06 per cent. of men employed in 1898 to 3·43 per cent. in 1913 is quite remarkable. This, it will be remembered, is attributed to the Company's system of appointing juries of the workmen, presided over by one of the engineers, to inquire into every accident that occurs. The object of such inquiries, so far as accident prevention is concerned, is, of course, to adopt the most approved preventative measures suggested by a full inquiry by men who are absolutely *au fait* with the exact conditions.

In this connection it is interesting and surprising to compare accident statistics in other industries. Mr. John Burns, speaking at the annual dinner of the Manchester Association of Engineers, gave some figures which show conclusively that the South Metropolitan Company are to be congratulated on their results in this respect. He said: "Every year 300 men were killed outright and 300,000 were injured. The accidents ranged from 5 per 1000 in the carpet-making industry to 56 per 1000 in the engineering industry, 100 per 1000 at docks and wharves, and 158 per 1000 among miners." On this showing, the South Metropolitan Company's latest figure is exceedingly low.

Purification.

Mr. W. J. Rendell Baker's account of the alterations he made at Malvern, and of the great improvement made in the purifying results, should be read by every gas engineer. That it should be possible to work a series of boxes continuously for two years without a change of material, and after that lapse of time to be able to work-up the oxide to a sulphur content of 57·25 per cent., is truly astonishing. Several factors, all of them favourable, probably account for this result. There are the large area, the quality of the material ("Lux"), the backward rotation system, the novel plan of reversing the inlets and outlets on each box, and, perhaps, the use of coke breeze in place of sawdust as the lightening material. The three first-named factors are well known; but the fourth is worthy of close consideration. The actual effect of reversing the flow of gas in a purifier is by nc means apparent at first sight; and I should be much obliged if Mr. Baker would enlarge on the remarks he made in his address on this particular point. What advantages does he claim for this arrangement? And how does he use it in practice?

He states that a catch-box is an essential part of a backward rotation system. Having worked on this principle for upwards of three years without any catch-box, I am unable to agree with him that it is "essential," but I do agree that a catch-box is undoubtedly a great advantage. As regards the admission of air, I have found it convenient to use a supply of air, when required, from an air compressor that is daily in use for another purpose. I mention this as in my own works the idea was only an afterthought, and might be adaptable to other works. An oxygen test on the gas is the best means of regulating the air admission in such a case.

Lightening Materials.

The use of coke breeze as lightening material in place of sawdust has hitherto been taken seriously by but few gas engineers. Now that it has been associated with such successful results, it should undoubtedly be tested carefully in other works, as sawdust is by no means an ideal material for the purpose. It would enhance the value of Mr. Baker's remarks were he to state the exact size of coke breeze that he uses. He further suggests, as suitable material, the wood borings from a mortising machine. Better still, however, are the chips from a planing machine; for these consist of small rolls of fine shavings which are ideal for lightening so close and heavy a material as oxide of iron. I have found them to answer admirably; and so far as the quantity required is concerned, any timber merchant can supply the demand.

HIGHER GAS-COOKER EFFICIENCIES.

Results of Work Carried out in the Laboratories of the Richmond Gas Stove and Meter Company.

For the space of twenty years or so, the makers of ordinary gas-cooking stoves have done very little towards improving thermal efficiencies. Attention appears to have been largely directed by them to the raising of the radiant heat efficiency of gas-fires, to ensuring their hygienic efficiency, and to improving their appearance, as well as to developing the efficiency of water-heating apparatus, and to designing and improving gas appliances for industrial use. The cooker has the while stood by largely neglected. Packed cookers have been more freely produced; and the design has been improved so as to facilitate cleaning and maintenance of parts and burners. But this is all structural; and little consideration has been given to the question of securing higher efficiencies from the cookers—especially from the top-plates. One reason for this is, we think, that B.Th.U's. supplied by gas are so cheap that there has been no imperative necessity for dealing with the subject. Convenience has, in this case, been superior to economy. Spasmodic reference has been made to the matter; but nothing has been done by makers of the ordinary types of cookers.

The Electrical View of Efficiencies.

We are inclined to give some credit to the electrical industry for turning attention to the cooker efficiency question rather more frequently than would otherwise have been the case, through the claims and efficiency comparisons put forward in connection with electric cookery productions. But the competing industry labours under the initial disadvantage that electrical B.Th.U's. are very expensive things. To get the high efficiencies of which they speak, in using their appliances, one must not do this or that. The oven-door must not be opened while baking is proceeding; for the internal temperature must be jealously guarded, and as little heat as possible be allowed to escape, either by radiation or in any other form. On their hot-plates, every square inch must be covered by the utensil, so as not to permit the slightest amount of the precious heat energy to escape without doing useful work. There must not be a grain of anything between the heating element and the utensil to prevent absolute contact; nor must there be a dent in the bottom of the utensil, or disaster to efficiency will occur. These are not conditions, apart from the expensiveness of the heat energy, that will contribute to popularity of the electrical method in the ordinary household, where, unless expert electrical cooks are kept upon the premises, all the conditions adverse to the securing of the highest possible heat efficiency from the current consumed are certain to arise. Our electrical friends accuse the gas-cooker of having a very low efficiency—that is to say, that a very low percentage of the heat units do useful work, and that a considerable percentage is wasted. The efficiency, even of the old types, is not so low as they assert; and the over-all efficiency leaves the electric-cooker and its hot-plate groping far behind in the matter of cash economy, and incompetent to attain to anything higher. The efficiency claimed for the electric-oven and its external auxiliaries is already said to be so high that there is no room for further gains; while the low efficiency electrically attributed to the gas-cooker and to the top-plate actually gives the makers a margin greater than they themselves claim upon which to work to gain greater efficiency—thus with success, apart from reductions in the price of gas, leaving the electrical method struggling further in the rear than ever with its adverse circumstances.

A Notable Advance.

However, while awarding the electrical people credit for keeping alive this question of cooker heat efficiency, we have also to give credit to the Richmond Gas Stove and Meter Company for having commenced to attack the problem before the electrical people had definitely made it one of the "planks in their platform." It is now quite three years since the firm, in their laboratories at Warrington, and with their own technical staff, began to investigate the cooker to see where efficiency improvements could be made; and constant endeavour has been rewarded by the making of such advances in the heat efficiency that over-all—oven and top-plate—it has been raised to such a degree that, under normal circumstances, there should be no difficulty on the part of the consumer, in the course of a twelvemonth, saving at least one-third of his cooker consumption. That is to say, if the annual cooking consumption of a household, including the free use of the top-plate, has been (say) 60,000 cubic feet per annum, then, when the new gas-oven and top-plate are available, there is no reason why the consumption should not drop to (say) 40,000 cubic feet. This bespeaks consideration as a very notable advance and tangible saving.

The cooker with its improved oven and top-plate as developed in the laboratory has been inspected by us with the burners in operation; but, at present, we are precluded from entering into structural details, or from giving any indication of the means by which the advance has been achieved, as it will take a little time for the firm to protect themselves, to make the necessary new patterns, and to get the cooker produced in quantities sufficient to place upon the market. The present article must therefore be taken to be merely preliminary. It is, in short, confined to the question of the efficiency realized; how achieved, must be deferred to a future occasion.

The Top-Plate.

The weakest part of the electric-cooker is the top-plate, or its equivalent—the extension hot-plates, as used with the "Tricity" cooker; and the top-plate being the part of a cooker that is in most general use (a point ignored by our electrical friends) makes the position all the worse for the electrical method. But it so happens, though work is done on the gas top-plate so much quicker and so much more economically than on the electric top-plate or hot-plates, it is also the most wasteful part, from the point of view of thermal efficiency, of the gas-cooker as ordinarily made. To the top-plate, the Richmond Gas-Stove Company's investigators (with Mr. Harold Hartley, M.Sc., at their head) have given a large amount of attention, and with gratifying success, which will be transferred shortly from the laboratory into daily household practice and economy—where the new cooker is adopted. The investigators soon found that, with the improvements devised as the result of their research—improvements which clear away heat-wasting parts of the design, and establish new parts—that, in order to preserve time efficiency, there was a point below which they must not descend in lessening consumption. What they have therefore done is to increase thermal efficiency while reducing consumption for a given operation, without extending the time required in its performance. This is highly important, because one complaint attaching to the electric top-plate is that it is not only costly but time-absorbing; and time is a matter of moment even in the kitchens of the wealthy.

The top-plate has been entirely improved in design, and so have the burners—the details of which will all be described in due season. There are on the top-plate four burners and a grill. One of the burners is for simmering, two are of medium size, and the fourth is a high-power boiling-burner. The simmering-burner is adjusted to consume 6 cubic feet of gas per hour, the two medium burners each 12 cubic feet per hour, and the large one 18 cubic feet per hour. Hitherto the approximate consumptions have been for various manufacturers' burners 7, 14, and 21 cubic feet per hour. The efficiency tests that have been made have been in comparison with other makes of cookers of relative size on the market, working at the points at which their best efficiencies were realized. In making the boiling tests on the top-plates, the same kettle was used throughout. It was a six-pint, tin-lined, flat-bottomed kettle (quite an ordinary one, and not a special one, as is necessitated by electrical operation), and four pints of water were heated from the temperature of the laboratory to 210° Fahr., the hot-plate bars and the burners being cold at the start.

The results obtained on Warrington coal gas used at 25-10ths pressure were these: The high-power boiling-burner on the Richmond new top-plate, adjusted to consume 18 cubic feet of gas per hour, was tested in comparison with a corresponding burner on another maker's stove, which burner consumed 21 cubic feet. In the first place, with the burner on the new Richmond top-plate the 4 pints of water were raised to boiling-point, on a consumption of 3 to 4 cubic feet less, while four minutes less were occupied in the work—the efficiency being 40·7 per cent., as compared with 25·8 per cent. on the burner on the competing stove. With the same burner on the competing stove, the consumption was cut down to 17·3 cubic feet per hour, to see what would be the effect; and the efficiency was only 23·5 per cent. There was one other competing stove which showed a higher percentage efficiency—round about 30 per cent.; but the figures already quoted for the competing stove are about the average obtained with other makes having comparable burners.

With one of the medium burners, consuming 12·1 cubic feet per hour, an efficiency of 46·4 per cent. was obtained. A competing stove, with a burner consuming 13·3 cubic feet per hour, gave an efficiency of 25·5 per cent. There again, there is a saving of 1·2 cubic feet; and nearly double the efficiency is obtained through the improved burner and its environment. The second medium burner on the Richmond top-plate, with a consumption of 11·8 cubic feet per hour, returned an efficiency of 42·3 per cent. The simmering-burner, consuming 5·7 cubic feet of gas per hour, gave an efficiency of 44·33 per cent. The simmering-burner on the first cooker brought into comparison (in the high-power burner tests), adjusted to use as much as 10 cubic feet per hour, gave an efficiency of 31·9 per cent. The consumption was cut down to 7·7 cubic feet with this stove; and the efficiency remained practically the same, 31·7 per cent. But even with this better result, the consumption was at the rate of 2 cubic feet per hour greater than with the simmering-burner on the improved Richmond top-plate, and the efficiency was considerably less. One of the noteworthy features of these tests is the very close approximation of the high efficiency results with all the burners on the improved top-plate—viz., 40·7, 46·4, 42·5, and 44·33. To obtain in useful work over 40 per cent. of the total heat generated by the combustion of the gas is excellent.

The Griller.

Coming to the griller, this is one of the most difficult parts of

the whole cooker construction from which to secure any considerable improvement in efficiency; but something has been achieved. The efficiency of the griller was determined by noting the amount of heat radiated on to a small radiometer area, 9 in. by 8 in., placed in the position (under the grill) ordinarily occupied by the food to be cooked. The radiant efficiency obtainable from all patterns of grillers is admittedly small; but by the new construction, an increase of 4 per cent. has been realized over certain other tested makes. This may not appear to be a large gain; but it must not be overlooked that an absolute increase of 4 per cent. is equivalent to more than 20 per cent. relative gain from a griller giving 18 per cent. efficiency. The other makes of griller found place between 18 and 20 per cent. efficiency; while the new form gave 22 per cent. efficiency. The griller has to be further studied, as there seems to be an excessive amount of heat escaping from its top. How to get over this is a difficult matter, without destroying the value of the grill when in use for grilling for the secondary purpose of boiling.

Over-all Efficiency on the Top-Plate.

To sum up the position, it may be taken that the new top-plate gives an over-all efficiency of about 40 per cent., as against an average of 23 per cent. with the various competing makes brought under test.

Increased Oven Efficiency.

Coming to the oven, here, as in connection with the top-plate, a description of the changes that have been effected must be deferred until a second article can be published. But this may be said, that a considerable saving in gas consumption has been effected, compared with the other makes with which comparison was made—the gas consumption has in fact been cut down to nearly one-half that usually required. The temperature to which work was carried experimentally was 300° Fahr. above the temperature of the room, or (say) 360°. The capacity of the oven is 3·398 cubic feet; and to maintain the temperature referred to, the consumption of gas was only 1·74 cubic feet per hour per cubic foot of oven area; the total consumption per hour being only 5·9 cubic feet. As oven capacity varies so considerably, the best indication of the consumption of gas is to quote it per unit area, or per cubic foot of oven space. The tests that were carried out with other stoves gave, in comparison, the following results:

	Content of Oven Cub. Ft.		Cub. Ft. of Gas per Cub. Ft. of Oven Space.
Richmond Improved	3·398	..	1·74
A	3·471	..	3·23
B	2·955	..	3·74
C	2·661	..	3·76
D	2·014	..	3·70
E	2·014	..	4·52
F	1·317	..	5·01
G	1·317	..	6·15
H	2·520	..	3·00
I	2·572	..	3·83
J	1·367	..	4·10

The next best consumption figure to the Richmond one of 1·74 cubic feet per cubic foot of oven space is 3·00 cubic feet, so this shows what a considerable saving has been effected; the average figure of the competing stoves running to a much higher level. To maintain the temperature of 300° Fahr. above the room temperature, the hourly gas consumption per oven ran from 5·9 to 11·2 cubic feet; but these figures, as the foregoing table indicates, have no particular value without consideration of the cubical capacity.

In Conclusion.

In an early part of this article, it was stated that it might confidently be asserted that, under normal and comparable circumstances, the user of one of the new ovens and top-plates might look to saving about a third of the annual consumption of gas for cooking. The figures which have been quoted show that the over-all efficiency of the cooker has been nearly doubled; so that the prediction as to saving is a fairly safe one. It may be that some people will look upon these tests, being laboratory ones, as not representing what can be done in the home. Let it not be forgotten that the tests of the new cooker have been made in comparison with commercial competitors—also in the laboratory. There is no reason why what is done in the laboratory should not be done in the home—stove, gas, and conditions all being equal. However, we repeat that the Richmond Company have by research made a notable advance in cooker efficiency.

TESTS FOR ELECTROLYSIS.

Errors in Interpretation.

A recent number of the "Electric Railway Journal" contained an article by Mr. Carl Hering on "Errors in the Interpretation of Tests for Electrolysis." In his introductory remarks the author said that though electrical engineering is justly termed the most exact of all branches of science, there are still three fields which are open to the charlatan for duping the public with sheer nonsense clothed in apparently serious terms. One of these is electrolysis, in the sense in which the term is used in connection with corrosion by currents from electric railways. The object of the author was to point out a few of the errors not infrequently made in regard to electrolysis by those who profess, and in some cases ought, to know better. The following are some few extracts from the article.

It has been repeatedly stated that if the voltage measured between two buried conductors is high, the mysterious iron-heating current becomes ravenous. As a matter of fact, it may be, and doubtless is, just the reverse. A high voltage merely indicates a stronger tendency for a great current to flow; but a low voltage by no means indicates that a very large current is not flowing. The supposed voltage of the "earth" is sometimes measured by driving a stake into it; old iron pipes being often used for the purpose. Sometimes one stake happens to be a galvanized pipe, while the other is a rusted one. A voltage which was not present before could be found to exist because the zinc and the rust form a depolarized battery. Consequently, not the earth but the one who is making the tests is responsible for the voltage. To be sure of what is actually going on, it is necessary to find out also whether or not a current is flowing, and, if so, how much. This determination is not always simple and easy; and this is especially the case for one who is not well versed in such measurements. Even if a current is found to be flowing in a pipe, it does not necessarily follow that this current is doing damage. It may be flowing out of the pipe harmlessly through a metallic connection instead of through an electrolyte like the liquids in the earth.

It has been asserted that, as the surface of pipes is large, quite a large current could be permitted to leave a pipe without doing much more damage than the usual and expected rusting. It is thereby assumed that the current leaves the pipe evenly distributed over its large surface. But the probabilities are generally quite strong that the contrary is the fact, and that the outflow will concentrate itself in one relatively small part where the conditions for its leaving the pipe and finding its way "home" are the most favourable. Thus, such a supposedly harmless current may then do serious damage. It has also been asserted that at least a certain voltage is required to make the current flow out; that is to say, a certain counter electromotive force must be overcome before a current can flow at all. Hence below this voltage there can be no current. This is also an error. The so-called counter electromotive force of iron when the current leaves it may actually be negative, and probably generally is so. Hence it tends actually to produce a current itself without external help; and if a good depolarizer happens to be present at the corresponding cathode, such a self-generated current would very likely flow and corrode the iron. This would be a case of damage for which the railway currents would in many cases be held responsible, even though they were not at all to blame. Pitting, which is often believed to establish the fact that the corrosion was electrolytic, may also be caused by such self-generated currents, if the stream of current happens to be localized at points by the surrounding soil or by holes in the paint on the pipe. On the other hand, the resistance, or, better, the virtual resistance, from a metal surface to the earth may be very high—so high, in fact, that at times it probably acts as a moderate insulator. The difficulties of making a good low-resistance connection with the earth for a large current are well known to those who have tried it. The ground itself seems to have a rather low resistance after the current penetrates some distance and gets well distributed in it.

Much has been said on paper about pipes being eaten away at a poor joint; hence the assertion about the danger of currents flowing lengthwise through a line of pipe. But have these cases been found as often as they have been talked and written about? If this is so serious, why are not the actual cases of such "sawed-off" pipes more numerous? The probabilities in such cases are that, owing to the high surface resistance the current generally gets into the ground over a larger area, and is not confined chiefly to a ring around the pipe right at the bad joint, which would be the cause of the "sawed-off" effect. Another not infrequent error may arise when one measures and expresses a true voltage in terms of resistance in ohms. This practice may lead to seriously false conclusions. A counter electromotive force is physically a very different thing from a resistance, even though both act jointly to oppose the flow of a current. While at times the measurement of volts in terms of ohms may be justified and correct for certain purposes, it should be done only by those who understand clearly what they are doing.

In many cases one of the most difficult measurements to make properly and reliably in tests for electrolysis is that of the currents flowing in inaccessible buried conductors or through the ground. At the same time this is often one of the most important measurements to make, for a mere voltage alone is not conclusive. The usual way of measuring such currents in pipes is to assume the resistance of a piece of the pipe, and then divide this into the drop of voltage. This, at times, is a very useful and convenient expedient for a very crude approximate measurement; but the error in the result is just as great as the error in the assumption. The actual resistance of a buried pipe may be quite different from that of samples of new pipe on which the tabulated figures are based. The writer has found discrepancies of as much as 100 per cent. between the actual and the tabulated assumed resistance of pipes. Moreover, in crossing valleys a line of water-pipe probably has much thicker walls than over hills; and it would not be possible to determine this thickness merely from the outside appearance.

THE NEW WORKS OF THE CHELTENHAM GAS COMPANY.

Inauguration Day.

All things that are subject to human decision cannot lay claim to an unalloyed appropriateness; but there is an especial appropriateness in the bringing into service by the Cheltenham Gas Company of a complete new section of gas-works, standing quite independent of the old, just at the time when Mr. R. O. Paterson (whose name will always be indelibly associated with the years of the greatest expansion and prosperity of the Company) has retired from active official life as Engineer and General Manager after 43 years' work, and when the duties of his office have been taken up by his eldest son, Mr. James Paterson, M.A. A brief indication of the constitution of the new works appeared in our columns last week; the matter then published being reproduced from a souvenir that was prepared for the shareholders, and not designedly for the information of technical readers. But this new section of works, as observed, will always mark the change in official life—the handing over the helm by the father to the son. It does something more. It will carry a long way into the future the impression of the engineering and manufacturing opinions of the one who has so long successfully directed the technical and commercial fortunes of the Company; and it bestows upon the new Engineer and General Manager, at the very outset of the shouldering by him of his larger responsibilities, a new plant, and plenty of elbow room for current and future operations.

A complete new section of the kind is not built in a day; and this new section has been, and quite purposely, a long time in the making. There was no hurry, in view of the circumstance of the excellent work that was being obtained from the old No. 1 section, which, however, was getting crowded, and did not permit of extensions to cope with the future. But the manner, in the matters of time and "home work," in which the new works have been constructed has had an advantage for the new Engineer, in that during their progress he has seen them developed, and has helped his father in the task of their development, from foundations to completion. Hence the whole appropriateness of the official bringing of the works into active service within a short space of the change in official work—for they are, in fact, a memorial to a long service; and with them and the new Engineer a fresh chapter in the Company's history opens.

The Formal Inauguration.

The formal inauguration of the new section took place on Monday last week—in quite a simple and unpretentious way. The Company did not ask anyone to come and rejoice with them on the occasion. They had purely a family party—a large party of shareholding Cheltonians—ladies as well as gentlemen—among whom members of the Corporation are included. His Worship the Mayor (Mr. W. N. Skillicorne), who is a Director, was of the number. Thus the Gas Company is in itself representative of the life and work, in more ways than that of being a commercial undertaking, of world-renowned Cheltenham. The proceedings of the day commenced with the holding of the annual general meeting, under the genial chairmanship of Mr. R. Ticehurst; and the other Directors present were Mr. Skillicorne, Mr. H. Jordan, Mr. H. A. Thomas, Mr. F. Ticehurst, and Sir H. M. Winterbotham, K.C.S.I. Mr. J. B. Winterbotham was abroad, and so was compelled to miss the pleasures of the day. Mr. R. O. Paterson (whose services the Company mean to retain as Consulting Engineer, as long as he is pleased to continue in this office) sat next to the Chairman, and the new Engineer by his father. Mr. A. H. Wyatt, the Clerk to the Company, was also present. It is not customary for the shareholders to meet at the offices attaching to the works in the Gloucester Road; but they did so on this occasion, in view of the special event. They heard from their Chairman an excellent account of the position of the concern, which, of course, has temporarily suffered in common with the rest of the gas industry from adverse market conditions and the mild weather of last autumn. But the gratifying fact stands out large that the revenue from all sources during 1913 amounted to £75,890, which is in excess of all other years, excepting 1912, which the coal strike made abnormally yielding in the matter of revenue from gas, which has a present ordinary selling price in Cheltenham of 2s. 1d. per 1000 cubic feet, less the general statutory discount of 5 per cent., bringing the net cost to 1s. 11¾d. per 1000 cubic feet for consumers who pay contentedly in fourteen days. We cannot refrain from breaking off in this sketch of the day's proceedings to record Mr. Ticehurst's own graceful reference to the retirement of Mr. Paterson, and appreciation of his services, as well as the expression of good wishes for the new Engineer and General Manager. He said:

> We all know how well the undertaking has flourished during Mr. Paterson's managership. He was appointed Assistant Engineer to the late Mr. Esson in February, 1870; and on the death of the latter in July of that year he became Engineer and General Manager, which post he occupied until his retirement—a period of over 43 years. Mr. Paterson is held in the highest esteem by the whole gas engineering profession. Among other positions in his profession, he was President of the Gas Institute in 1883. His general skill and experience of matters pertaining to gas manufacture and the residuals therefrom has made his opinion much sought after by the gas industry generally. In his place, the Directors have appointed his son, Mr. James Paterson; and in doing so, we hope and believe he will follow in the traditions of his father and help the Company in everything the same as he has done. Mr. James Paterson came to us with the very best credentials some three years ago, when he was appointed as General Assistant to Mr. R. O. Paterson. Prior to that he had for upwards of seven years been Engineer and General Manager of the Redhill Gas Company. Mr. James Paterson had testimony to his efficiency from the late Sir George Livesey, the then Chairman of the South Metropolitan Gas Company.
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> From the shareholders' side of the table, Mr. J. Sawyer (a County Councillor) spoke in appreciation of the services of Mr. R. O. Paterson. A Company, he said, never had a more loyal or efficient servant, and he could wish the son nothing better than that he might follow in his father's footsteps.

Nothing could have been more apposite; and the memory of such an appreciation at the close of 43 years' service will be for Mr. Paterson to the end of his life an enduring and pleasant recollection. It is abundantly clear that all at Cheltenham have one consistent view on this particular subject.

We must get away from the meeting of the shareholders. Immediately it was over, those present passed to the large room above; and, with the Chairman presiding, they celebrated by a luncheon the inauguration of the new (or No. 2) section of the works. The seating and table capacity of the room was strained to its fullest limits. A few ladies graced by their presence the special occasion; among them being Mrs. R. O. Paterson, who had come up from Weston-super-Mare—the seaside resort selected for the, it is hoped, many years of rest and health ahead. It was a very happy gathering; and it was an excellent lunch. Afterwards the loyal toasts were honoured, and other toasts occupied attention. A summarized report of the speeches will be found appended to this sketch.

At the close of the lunch, in the yard below a photographic record was made of the company who were associated in this celebration of a unique occasion. Lying just at the back of the party were observed a number of scrapped meters, bearing the words "Esson's patent"—Mr. Esson, as already recorded, was Mr. R. O. Paterson's predecessor, and father of Mrs. Paterson.

The New Section Inspected.

Accompanied by the Chairman and Directors, and Consulting Engineer, and under the guidance of the Engineer, Mr. L. E. Twycross, the Assistant Engineer (whose name will be recognized as being associated with the coal-liming process as practised at Cheltenham), Mr. J. Kane, the works' superintendent, and Mr. J. Hambling, the yard foreman, an inspection was made of the new works, which one day will no doubt supersede No. 1 section, but at present is auxiliary to it.

To reach the section, the company walked along the railway viaduct, which has been in use now some sixteen years, and supplanted the old and costly system of carting material by road. The railway waggons that convey coal to the works are of the side-tipping type; and the coal is directed from them by side shoots down into the covered coal-store adjoining the retort-house, or is carried by small tip bogeys running on a narrow-gauge tramway, with interlacing roads and turntables, to any part of the stores. The coal breaker and elevator (West's) in the covered coal-store were working, and the plant treating the coal with lime was observed. Standing on the viaduct, it was noted that the Company have a good expanse of ground for the future development of the works, and that, in the design of the new section, the ground was plotted-out so as to have plenty of space between the buildings. Throughout the section one feels that there is room to breathe, and to freely carry on the operations.

"Home-Made" Works.

Earlier in this descriptive article, the new section of works was termed "home-made." There is, in fact, nothing at all about it, except the mechanical plant and ironwork that was made outside the Company. We know that, in the past, the late Engineer and General Manager has been no devotee to gas-engineering fashion. He has always pursued an independent course, such as personal experience and results of operation have dictated; and nowhere in the country will gas plant be found of a more simple character in a works of equal size, and yet, long before gas-plant elaboration became the order of the day, Cheltenham was producing results second to none in the country. The same characteristic is found throughout section No. 2, and the results are of a kind that stand well in the comparison with other types of plant and modern method. Stubborn are such facts. However, about the "home-made" feature of the works. Before lime purification was discarded, and coal-liming was adopted (Cheltenham has no liking for an excess of carbon bisulphide in its gas), the Engineer was much put to it to find a place for the deposit of spent lime, and it could not be otherwise disposed of. Under the land set apart for future developments extends the great geological formation—here some 600 to 700 feet in depth—of Blue Lias clay. Mr. Paterson determined to remove part of this, and so find accommodation for the spent lime; and, in anticipation of the building of the new section, to utilize the clay for the manufacture of bricks for the buildings. This was done. On the site

the bricks were made by the Company's own men; and, by the Company's own men all the building work, from foundations upwards, was executed. Externally the buildings constructed of the blue lias bricks are clean looking; internally they are spacious, light, and well ventilated. They make a very fine-looking range; being in the main set parallel one to the other. The roofs are light—being supported by standard members, with corrugated iron or pitch-pine lings as appropriate, and red tiled. The retort-house and purifier-house are each left with one end temporarily filled in, so as to allow of extensions.

In the Retort-House.

The retort-house at present contains ten settings of horizontal "nines;" and the scheme contemplates for the future extension of the house fifteen additional settings. The dimensions of the house as it at present stands, with its temporarily filled-in end, are 70 ft. wide, 132 ft. long, and the height from ground level to the apex of the roof is 62 ft. The stage floor (the paving of which is constructed of Malvern Hill granite and cement) is 12 feet from ground-level; so that the basement is of ample dimensions. The ten settings each contain nine ⌂ section horizontal retorts, tile-built, 20 ft. 9 in. in length, with a 9-inch stop in the middle; so that there are to all intents and purposes in the house 180 stop-ended retorts of 10-feet length. This clearly shows that Mr. R. O. Paterson in designing this plant did not deem it necessary, in view of his results in No. 1 section, to make any departure from the principle of construction which had given him, year in year out, such excellent returns. As in No. 1 section, a big combustion chamber is a feature of the settings; and the heats——well, we can only say "*ne plus ultra*." Again, we find dry mains and throttle valves at the top of the ascensions. Governors are eschewed; nothing but a steady pull is maintained, according to the quality of the gas being made. By the way, the men work to a certain make of gas per hour; and the exhausters are set to this make. Then if the daily tests show that the illuminating power is higher than there is any occasion for, the pull is increased. The make goes up or down (within certain limits), with the illuminating power taken as the working guide. At the present time, the make, using Yorkshire and Derbyshire coal, is between 13,000 and 14,000 cubic feet per ton of coal; and 4 cwt. charges are the rule, with eight-hour working. To give a round figure, the make from the existing ten beds is about 1½ millions, while the output of the old section is some 2·6 millions.

One of West's combined (compressed-air) charging and discharging machines is applied to either side of the bench; being coal fed by central overhead hoppers, each of 40 tons capacity. On discharging the retorts, the incandescent coke falls through openings in the stage-floor into tip bogeys, and is quenched in the basement. The bogeys (which run on a 2-feet gauge tramway) are, at the end of each draw, elevated to the outside coke gantry, by means of a lift operated by compressed air, and so stacked in the open. The method of operation saves the coke from producing an excessive quantity of breeze.

Condensing, Washing, and Scrubbing Plant.

Passing over to the plant house (and learning as we do so that the connections up to this point are 24-inch, and beyond 20-inch), we find centrally placed in this building nine R. & J. Dempster annular condensers, of good capacity, constituting a reserve of power ample for all emergencies and prospective retort-house extensions. A foundation has also been provided for a water-tube condenser. In another part of the house is seen a C. & W. Walker's tar-extractor. The scrubbers are situated in range with the condensers. These are by Dempster, and are fitted at the top with turbines for distributing the liquor. Close by the tar-extractor is a Kirkham washer-scrubber of 3 millions capacity. This is operated by a vertical engine, with worm-gearing operating in oil. The smooth running is noticeable. At one end of the same portion of the building is a Livesey washer for naphthalene extraction, also by Dempster. Very careful records are kept of the gas temperatures; and near the top of the condensers is noticed a platform for the purpose of maintaining a constant watch over the temperatures of the gas at this point. On a tower outside the house is a large tank, part of which is for the supply of water to the boilers, and the other part is utilized as a tar and liquor tank.

The Power House.

Some beautiful machinery is found in the power house, which in itself forms a worthy setting to the plant. Foundations are already in for duplicating the various machines, when necessity commands. The first plant to attract notice are the duplicate sets of Donkin exhausters, with vertical engines, and a capacity of 80,000 cubic feet per hour each. The exhausters are of the makers' standard compressor design, modified to suit requirements. Their high finish and smooth running are a credit to their makers, and something that a mechanical engineer finds good to look upon. In observing this point, attention is directed to a new recording-gauge by William Sugg and Co., which shows the very steady turning moment of the exhauster shaft. This gauge indicates on the paper by dots, and not by a continuous line, so there is not the blurred effect that one gets on the charts with some forms of recorders. While observing this, a fine case of gauges, a King's gauge, and a jet photometer are noticed in the room. In connection with the last-named, the attendant makes an hourly reading of the jet, and presents each day's readings in the form of a curve. It was also remarked here that the whole section is in communication within itself and with the old No. 1 section by a telephonic system. But there is another fine piece of plant which claims attention. It is a West two-stage, double-acting type of air-compressor, driven by a 45-horse power steam-engine, with automatic cut-off; its duty being to furnish the motive power for the retort-house machinery and the lift motor, and incidentally it provides the air-blast for the smith's forge in another part of the works.

Adjoining is the boiler-house; and this is fitted with two Galloway boilers, with Wilton's patent furnace and forced draught. They are 7 ft. 6 in. by 30 ft. boilers. Accommodation is reserved alongside for two other boilers of equal dimensions. In one corner of this roomy boiler-house is a patent water softener or heater and filter, by Joseph Wright and Co., of Tipton.

The Purifying-Plant.

The purifier-house is another fine building. The boxes (six in number, and 30 ft. by 40 ft. and 6 ft. deep) are elevated, and have bottom discharge-doors; the ground floor being used for the revivification of the Lux or bog ore used. The purifiers were made by Walker; and they are fitted with Weck valves. The purifiers (which have six lids to each, with rubber joints), are arranged in two parallel lines; and travelling chain gear is provided over each line for lid-lifting purposes. The purifying material is raised from the ground floor by a couple of quite small bucket elevators (driven by Robey engines), which deliver on to the stage-floor into tip-skips on wheels for emptying into the boxes. The boxes are worked four in series (three on, and one off), with two catch-boxes. One end of the house (the upper part of the building is completely enclosed) is temporarily boarded in, in view of prospective extensions—in fact, the foundations to ground-level are already in for the doubling of the area of the building.

Hard by, is a large capacity underground tar and liquor tank (rectangular), fitted with a derrick for raising or lowering the liquor suction pipe.

Station Meter-House, Works Offices, Shops, Test-Rooms.

The meter-house is an exceedingly nice building with its red-tiled floor, red dado, grey colouring of the upper part of the walls, and pitch-pine lined roof. The house is occupied on one side by a Parkinson and Cowan 100,000 cubic feet per hour station meter, with the connections in an open railed-off well at the rear, so as to be both visible and accessible. There is room here for another meter.

Behind the meter-house are the coke weigh-offices, the superintendent's office, photometer-room, laboratory, and a fitter's shop, with forge and overhead store.

In those parts of the works where accumulations of gas may occur, electric-lamps are used; the current being generated in No. 1 section. In other parts of the works, inverted gas-lamps are employed.

An Economically Built Works.

It will have been seen that the new section is a complete works in itself—all but the gasholders, which are located in No. 1 section. The Company are to be congratulated upon having secured a works very economically constructed, and so designed with an eye to the future that the productive capacity can be considerably enlarged at a much lower addition per unit of output to capital—thus still further reducing the low average of capital spent per unit of output upon the section. In the new works, the late Engineer has bequeathed to the Company something which will take an imposing part in the future economy and prosperity of the concern.

THE PROCEEDINGS AT THE LUNCHEON.

We have deferred giving a report of the speeches made at the luncheon to the end of our account of the inauguration proceedings yesterday week, so as not to allow the eloquence of the occasion to form a large break in the continuity of the story.

The toast of "His Majesty the King, Her Majesty the Queen, the Prince of Wales, and other members of the Royal Family" having been given by the Chairman, and duly honoured,

Progress of the Company—No Need to Apply to America for a New Manager.

Alderman Waghorne proposed success to the Cheltenham Gas Company. He said he should have liked to have amended the toast by prefacing it with the word "continued." Having thanked the Chairman and Directors, on behalf of those present, for the hospitality with which they had marked the occasion, he said he took it that he had been called upon to propose the toast because of his association with a family who had been so long connected with the fortunes of their prosperous Company. As those present knew, the late Mr. Frederick Griffiths succeeded his father as Clerk to the Company; and after he had held the office for upwards of fifty years, to the complete satisfaction of the shareholders, his (Alderman Waghorne's) partner—the late Mr. Walter Griffiths—was appointed to the post. He, from personal knowledge, could testify to the great interest that Mr. Griffiths took in the affairs of the Company, both through his love of duty, and owing to the fact some few years ago that he was, with the members of his family, the largest shareholder in the Company. The family were still considerably interested. Their prosperous Company was approaching its centenary, because it was in the year 1819 that the first Act of Parliament was

obtained which incorporated the Company, and led on and up to the present favourable position. Turning over the leaves of an old history of Cheltenham, he came upon a reference to the inception of the Company which was that day celebrating such an important event in its progressive history. It was as follows :—

EXTRACT FROM "GRIFFITH'S HISTORY OF CHELTENHAM," 1826.

"Early in the year 1818, a plan was submitted to the Commissioners by the late Mr. J. D. Kelly, for lighting the town of Cheltenham with gas; and when the preliminaries were arranged, a contract was entered into for that purpose. On this occasion, the liberal spirit of the inhabitants was conspicuous; for in less than a week a sum amounting to nearly £20,000 was raised by the sale of shares at £50 each. And on the next meeting of Parliament, the Cheltenham Gaslight Act was obtained, an abstract of which may be seen in the appendix. An extensive gasometer, with the usual apparatus, was built just beyond the Tewkesbury turnpike; and on the evening of the 28th of September in the same year, the oil-lamps were relinquished, and the town was for the first time lighted by gas. Since that period many improvements have, of course, been made; and so admirably has the undertaking succeeded, that it is not possible for a stranger to form any adequate idea of the brilliant appearance of Cheltenham by night. But we may, with the greatest confidence, assert that it excels any town in the kingdom in the splendour of its illumination."

That excellence of illumination was entirely due to the Gas Company of those days. When one considered what an effort it must have been to have raised the £20,000, he thought those who subscribed the sum, if they could have been present that day, would have been surprised to find the Company with works covering such a large area, and with a capital representing nearly one-third of a million sterling. Examining the accounts, it would be seen that not only had the Company a large and valuable property which was supplying the requirements of the town of Cheltenham and outlying districts, but that they now had a reserve which was equal to more than the capital that was employed in the early days of the Company. Although the Company had had some difficulties to overcome, it had succeeded in paying varying dividends to the shareholders, but never less than 5 per cent., and on many occasions, when they were not limited by statutory authority, a great deal more. When they considered the position of the concern that day, they might congratulate the Directors on the successful results of the working. That their stock had the confidence of the public was shown by the fact that there was an item in the balance-sheet of something like £6000 or £7000 for premiums, upon which no dividend was being paid. This, he thought, spoke highly for the stability of the Company. If he were advising a client as to a security in which he could safely invest money, he should not counsel him to put it into Consols, but into the Cheltenham Gas Company. ["Hear, hear."] As to the secret of the Company's success, he believed that it was due, in the first place, to the fact that the Company had been governed by a Board of Directors who were actuated by business habits and by a sincere desire to give of their best services to the Company; and, in the second place, to the fact that the Directors had had the benefit of the skill and ability of a good Engineer and Manager and staff. He remembered (although he was not very old then) when the late Mr. Esson was the Manager, and what talk there was in the town when he resigned. He was succeeded by their excellent friend and capable late Manager (Mr. R. O. Paterson), who, as their Chairman had said that day, had filled the position with the greatest ability, and with a result entirely satisfactory to the Company, for the long period of 43 years. All honour to Mr. Paterson for the services he had rendered. Mr. Paterson had resigned the position, and he (Alderman Waghorne) congratulated the Company upon the fact that they had not had to go to America in order to obtain a successor. [Laughter.] They found one who was home-bred, whose interests were bound up with those of Cheltenham, and whose abilities were equal, if they did not excel, any American whom the Directors might have found for the post. [Laughter, and "Hear, hear."] The shareholders wished Mr. R. O. Paterson all happiness in his partial retirement. He was glad that he could use the word "partial," because their friend would continue to give the Company his advice as their Consulting Engineer. The shareholders also extended to his son their best wishes for the future. [Cheers.] As a townsman and a member of the Corporation, he (Alderman Waghorne) thought that every fellow-townsman ought to be interested in the Company for many reasons. One of the chief was that the Company provided employment for a large number of men; and when one considered that the Company spent nearly £7000 in wages and another £2000 or £3000 in salaries, this showed how much the town was concerned in the fortunes of the undertaking; and why the town should give the Company support in every shape and form. The Company's difficulties and anxieties in the past had been largely caused by the action of the governing body. But now one of the Directors held the position of Mayor. He was glad that the "Jameson raid" of some years back (when the Corporation tried to get hold of the concern) failed, because the Company had since then progressed and progressed. And he could congratulate the Directors upon the fact that they had never had to apply for a loan in order to make up the deficiencies of income for past years. He had faith, even if it were possible to so apply, that they never would have to do so.

MORE HISTORICAL POINTS.

The CHAIRMAN thanked Alderman Waghorne for the kind way in which he had proposed the toast. The fact that the proposer of the toast had traversed much of the ground that he (the Chairman) had intended to cover in his reply showed how legal minds jumped together. [Laughter.] The office of Clerk to the Company reposed in the Griffiths family from 1819 to 1905; and there was no doubt that the latter of those years were ones of great prosperity to the Company. That day, and this function, marked a milestone in the history of the Company. They had started the No. 2 works, which the shareholders were going to inspect. It was not without hesitation that the Directors in 1900 first sanctioned the erection of the works which had been recommended to them by their Manager. But not knowing much about a big scheme of the kind, the Directors then thought they would like to have the proposal confirmed by one of the best men of the day; and so they had Sir George Livesey down. His report assured them that they had practically no alternative but to prepare for an increase of business, and that this ought to be done as early as possible. Under the able management of Mr. Paterson, they had been able to spread the provision of new works over ten years; and, by going slow, they had worked economically. If they compared the new plant with that in the No. 1 station, they would see the improvement that had been made in gas plant and operation. They were bound to keep on moving; and they had now in the new section a quite up-to-date plant. The Company was started in 1818; and their first Act was passed in 1819. Their Clerk (Mr. Wyatt) had brought down the deed whereby the inception of the Company was made. Alderman Waghorne had referred to the difficulty that there was in raising the £20,000 for the formation of the Company; but it must be remembered that the shares were £50 ones, and that there was a difficulty in getting people to pay up for them. Altogether, the Company had a troublous time until 1849 or thereabouts, and then prosperity was assured. Prior to that date, the arrangement was that the Company charged for light at so much per burner. They had prices for Nos. 1, 2, 3, 4, 5, and 6 burners. No. 6 was the largest size: and the public spirit of the Company was shown by the fact that in March, 1819, a contract was entered into to light the theatre with gas with forty No. 6 lights at a cost of 100 guineas per annum for 78 nights in the year. This lighting really ought to have brought in an income of £250, at the price then charged per light. Afterwards there was an agitation among the customers to have meters; but the Gas Company did not then grant meters. He supposed this was due to the fact that there were no reliable meters in existence in those days. The consumers were quite equal to the occasion. They got No. 1 burners; and, by the aid of a penknife, extracted from them what ought only to have passed through No. 6 burners. The Company then had meters. But the system of burner rental absolutely lasted until his (the Chairman's) time. He was appointed a Director in 1891; and in 1896 he found there was a person in Cheltenham who had gas on an annual rental of £3. He told his colleagues that this consumer would be having gas-fires fixed all over his place under such terms, and that they must stop it, and give the supply by meter in the ordinary way. This was done. There was a certain amount of sentiment about it, in that the consumer in question had had a relative who was appointed one of the original Directors by the old Committee of Management. When he (the Chairman) was appointed a Director in 1891, there were 200 shareholders; now there were 400. They had brought the railway to the works; they had provided a recreation ground for the employees; and they had the new works. They had kept the Company up-to-date. In saying this, he gave the credit to their late Manager, from whom, among other things, emanated the suggestion some years ago (which was adopted) that the Company should have a firm of Chartered Accountants to audit the books. The appointment of their new Manager, much as he regretted the retirement of their old one, was on the right lines. Some years ago—quite ten years ago—he spoke to Mr. Paterson about having an understudy. But Mr. Paterson said he did not know where to look for one. He was continually "at" Mr. Paterson; and it was only in course of time that they got his son to come and be his understudy. His (the Chairman's) experience was that the business that was handed down from father to son was more likely to prosper than any other business. Mr. Paterson had handed his work down to his son; and he (the Chairman) hoped and believed the Company would have as great a success under the management of the son as they had had under that of the father. He was reminded that Mr. Esson was the grandfather of their new Manager; so that the management had been handed down to the third generation, and he hoped it would go through to the fourth. [Laughter.] He asked to be allowed to propose the toast of "Long life, health, and happiness to their old friend and manager, Mr. Paterson;" and he coupled with that the name of his wife.

FAREWELL TO OFFICIAL LIFE.

Mr. PATERSON (who was received with loud and long cheering) said it was rather difficult for him to hold himself quite in hand after the hearty reception given to the toast the Chairman had proposed. He could only say this: At the close of his professional career, he felt it an honour to be thus received by a large body of the shareholders of the Company. Without the slightest feeling of egotism, he could say that the Company's interests had been his first care throughout the whole of his career. He was sure they would excuse him saying again it was a pleasure to feel that these services, however humble they might have been, had been acceptable to the Board and the shareholders. This was in the nature of a farewell meeting—that was, so far as the Company's old manager was concerned. It had been in contemplation at this meeting to see the opening of the No. 2 station; and he should like to say that the delay there had been in the building of these works, and putting them into operation had not been an accident, but it had been designedly arranged, for many reasons. Now the time had come when the works were completed, and for the shareholders to inaugurate them by making a formal inspection. He might perhaps just say a few words as to the construction of the works. The site was at one time a large heap of old spent gas lime—a heap consisting of some thousands of tons. It was impossible to find in the neighbourhood any place in which to bury it. The Company had filled up the whole of the brick pits round about the countryside; and there was nothing to do but to put the spent lime on the land of No. 2 station. The difficulty was a very pressing one. The land was being occupied; and nothing could be done, because the heap of lime was there. The only thing for them to do was to dig a big hole on the works, and so dispose of the lime. They did this, both for that purpose, and in order that they might get out clay to make the bricks for the new station on the premises. The buildings, therefore, consisted of bricks made from the subsoil that formerly existed where the buildings were now standing. The Company had themselves built the works; and what the shareholders would see that day had not had a contractor upon it. It had been carried out entirely by the Company's own workmen. [Cheers.] He thought that it might be a matter of interest to the shareholders to know that was the process by which No. 2 station came into existence. He would not say anything as to the excellent results that were now being obtained, except this, that

everything was going on successfully, and the installation, he was sure, would prove an economical one in gas manufacture. The close of his career there, after 43 years' service, was a matter of constant regret to him personally. He did not regret what he had done: his regret was that years necessitated him handing over the management to a younger man. Although he was the father of the new Manager, he did not hesitate to say that he believed the Chairman was right in concluding that the work would be done as well in the future as in the past. It was perhaps a unique position that grandfather, father, and son had been the order of succession in the management of one undertaking. In conclusion, he begged to thank them one and all for their kind reception of him, and for having associated his wife with the toast.

Mr. J. G. VILLAR, in proposing the toast of "The Press," remarked that Mr. R. O. Paterson had been, and he knew was, recognized in the gas profession as one of the most successful of gas engineers. On retiring from the service, he left the shareholders in possession of a highly prosperous concern.

Acknowledgment was made of this final toast; and shortly afterwards the shareholders descended to the works, and made inspection of their new possessions, as already described.

REFRACTORY MATERIALS IN GAS-WORKS.

By J. W. MELLOR, D.Sc.

[A Lecture delivered before the Manchester District Junior Gas Association last Saturday.]

INTRODUCTION.

How many have realized the important *rôle* played by clay in the industries generally? There are indeed very few, if any, industries which are not directly dependent in some way upon clay products. Every improvement in the quality of refractory materials must be followed by advances in many of the dependent industries. For instance, the raising of the refractory qualities of fire-bricks would give the metallurgist greater power and greater scope; and the success of the electro-chemical industries is to a large extent dependent upon the capability of the potter. The gas industries, too, are now striving to make their processes more efficient; and, as one consequence, they are clamouring for improvements in the quality of their refractories. It is clearly "up-against" the manufacturer of gas retorts and settings to meet this demand, or to know the reason why it it should be otherwise. If the *pros* and *cons* be investigated, it will most certainly be found that there are faults on both sides.

On the one hand, it would be easy to demonstrate how some gas engineers have made unreasonable demands upon the refractories—showing that such men are working in complete ignorance of the nature and character of their materials. It is possible to cite cases which are as absurd as the demand for a platinum dish to withstand the corrosive action of boiling aqua regia. Ignominious failure alone can attend on such unreasonableness. Curiously enough, this same unreason has more than once served as a text for belittling home and for belauding continental manufacturers, and for demonstrating that the Secretary and members of the Refractory Materials Committee of the Institution of Gas Engineers know nothing about refractories.

On the other hand, the gas engineers seem to be more than justified in asking or demanding from the manufacturer a product better fitted to withstand the more exacting conditions of modern practice than is obtained when retorts and settings were not so severely punished as they are by the fiercer fires which prevail to-day. The manufacturer of refractories might answer that "God has placed the clays in their present *situ;*" that "clay is clay;" and that "no man can get from a clay what is not in the clay." Talk of this kind is usually evidence of degeneration. The handing-down of jealously-guarded manufacturing details from father to son might have a disastrous effect on the best of sons. He grows strong in the belief that a mysterious virtue resides in hoary old methods. As a result, the spirit of adaptation is atrophied, and a feeling of sublime omniscience takes its place. Ignorance walks hand-in-hand with assurance. The blind worshipping of the methods of our ancestors is a pernicious evil if it blunts the faculties in this manner, for it then becomes impossible to conceive a variation in the original time-honoured procedure without an attendant disaster. All this means that the gas engineer claims that the failure to meet what he conceives to be reasonable demands is evidence of the use of inept antiquated methods by the manufacturer.

The very pertinent question naturally arises: "Is the British manufacturer really getting the best out of his clays?" It is perhaps easier to answer with a "No" than with a "Yes." Destructive criticism is so seductively easy that the critic is quickly deluded with the belief that he has achieved something, when in reality he has merely spilt much ink. Helpful constructive criticism is notoriously difficult, since something more than vague generalities and banal platitudes are required. I emphasized the fact in Manchester several years ago, that the clay industries have received remarkably few benefits from University research. Owing to some perverse dispensation, their numerous problems, which sit up and beg for a solution, have no attractions for well-equipped laboratories. The clay industries have not received their fair share of help from the Universities; and the theory of the art, in consequence, lags wofully behind its practice.

I am, however, wandering from the main theme of the lecture, which the Secretary has allotted to me: "Refractory Material as Used in Gas-Works, and the Testing of Same." It is therefore time I left the manufacturer to take up the material as it is supplied to the consumer.

WHAT IS THE SOFTENING TEMPERATURE OF A CLAY?

It is perhaps mere tautology to say that the first desideratum of a refractory is that it shall not soften at any temperature likely to be attained in a given furnace. What is to be understood by the softening temperature of a clay? The softening temperature of a clay expressed solely as a temperature effect may be somewhat misleading. A good average British fire-clay is often stated to soften at 1690° C. (3074° Fahr.). To determine this constant, the clay is moulded in the form of a cone, or a piece of brick or retort is chipped into an approximate cone, and heated on a rising temperature until it commences to squat as a whole, or until the angular edges of the piece commence to round-off by fusion. The tester may think that his number is very accurate because he has measured the temperature with a well-calibrated up-to-date pyrometer. As a matter of fact, this number is in itself of very little value. Ever since 1905, I have repeatedly emphasized that the function of time is as important as temperature in these determinations.

The reaction which takes place between the different components during the firing of clay wares can be detected when the temperature has reached the vicinity of 1000° C. (1832° Fahr.); and it then proceeds very slowly, but with an increasing speed as the temperature rises. When the temperature has reached the neighbourhood of 1200° C. (2192° Fahr.), the goods are supposed to be fired. The progress of the reaction up to a certain point can be approximately measured by the contraction which the mass undergoes. The body becomes more and more compact, and the end-product, if the firing were not arrested, would be a vitreous mass, not unlike stoneware. There are several complications, many of which I have discussed elsewhere; and most of them can be grouped under the general head of "Vitrification." Were it not for incipient vitrification, the fired body would crumble to bits very easily. The refractory or softening test indicates the temperature at which vitrification has proceeded so far that the mass is no longer able to retain its shape and it must perforce collapse or squat.

THE REFRACTORY TEST.

The squatting temperatures are usually determined by one of the numerous forms of the so-called thermoscopes or pyroscopes. These are usually supposed to indicate temperatures by the squatting of certain mixtures of clay and flux compounded in different proportions. Such mixtures have been used by potters for an indefinitely long time. Those in use to-day have been heated in a muffle, and the temperatures at which they squat is determined by a pyrometer. The most popular form is the so-called Seger cones; Holdcroft's bars are their rivals; Watkin's recorders and the so-called contraction bits are employed in special cases. When it is said that the softening temperature of a clay is cone No. 10, it is understood that if clay and cone be heated side by side they will squat together.

Suppose that a cone be heated up to its squatting temperature in an ordinary gas-muffle, and the squatting temperature be determined by a pyrometer. Take a specific example, cone No. 10 is observed to collapse at about 1300° C. when heated in a small gas-muffle; the same cone squats 100° lower when fired in an oven of which the temperature never reaches 1200° C. In the former case, the temperature was attained in about four hours, and in the latter case in about four days. Hence it requires four days to produce the same state of vitrification at 1200° as is attained by firing four hours to 1300°. Observe the effect. The oven fired to cone No. 10 is supposed to be fired at 1300°, whereas in reality it has never reached 1200°. Similar remarks apply to the cones generally. How many erroneous temperatures have crept into our note-books owing to ignorance of this fact!

Here is another illustration which occurred a couple of months ago. The refractoriness of a British fire-clay was reported at cone No. 35. Having expressed some doubts as to the accuracy of the work, the trial pieces were sent to me. Surely enough cone No. 35 was standing alongside the fired clay. The test had been made in one of those rapid injector furnaces, but when fired at the rate specified by the Gas Engineers' Committee, the clay squatted with cone No. 33. Had the firing temperature been less rapid, the squatting temperature would no doubt have appeared to be lower still; but the speeds of vitrification of the cones and clay at these low temperatures may be so slow that the result is not very different from that at which the cones have been standardized, which in turn is not very different from that of the gas engineers' specification. *The higher the temperature the faster the speed of vitrification.* It is accordingly not difficult to see, without the aid of mathematics, that *within certain limits the faster the rise of temperature the higher the apparent softening temperature of a refractory.* This deduction is supported by all the known facts.

The point I have just raised is a most important one, and is really the parent of a serious error. Another less subtle source of error arises when the cones and test-pieces are placed at some distance apart. It is very difficult to ensure a uniform temperature in different parts of a small muffle. With certain precautions against errors [two of which the lecturer indicated], there is no particular difficulty in testing the refractoriness of a clay or fire-

brick; and the results when the firing is done in an electric furnace ought to be compatible with those obtained in a gas-furnace. I prefer the former; but that is personal prejudice of no particular interest at the present time. The furnace I use is shown in fig. 1.

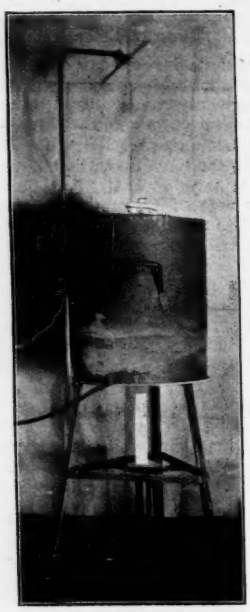


Fig. 1.—Electric Furnace for Refractory Tests.

Hirsch's addition is seen on the under side. This is an improvement on the older type of furnace, because it makes it easy to remove and insert the test-pieces. The mirror at the upper end of the furnace allows these pieces to be conveniently seen at any stage of the firing. The eyes should be shielded from the glass by suitable goggles.

We are now in a position to see there is no definite softening temperature for clays and related materials. The vitrification process furnishes a more or less viscous matrix, which becomes more and more mobile as the temperature rises. The collapse of clay or cone simply shows that the matrix is no longer viscid enough to enable it to keep its shape. The clay begins to run. Suppose a long piece of refractory material like a pyrometer-tube or gas-retort be supported horizontally at both ends, it will sag in a prolonged fire at a much lower temperature than the apparent softening temperature of the material of which it is made. The sagging, however, shows that the material has begun to flow. The unsupported parts are now under a stress. Similarly, the softening temperature of a clay appears to be reduced when the clay is fired under a load. The greater the load, the lower the apparent softening temperature. Similarly, a viscous fluid which is not mobile enough to flow under its own weight will most certainly flow if subjected to a great enough pressure.

After a great many trials and failures, I have designed a furnace which enables a refractory test to be conducted while the clay is subjected to any desired pressure, and exposed to any desired atmosphere. A rod of (say) carbon or zirconia is pressed by a

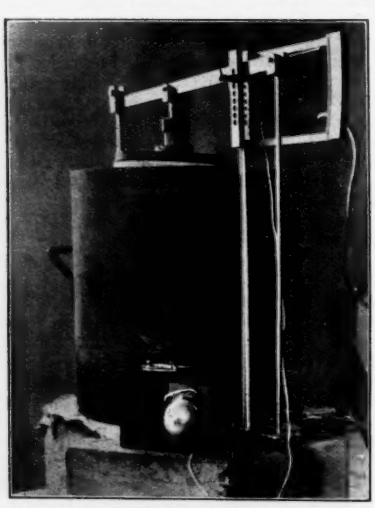


Fig. 2.—Electric Furnace for Refractory Tests under Different Loads.

lever of the third class on to a cylindrical test-piece surrounded by cones. The lever is arranged so that it rings a bell when the clay has started to collapse. The apparatus, upon which tests are now being made, is shown in fig. 2. The collapsing temperature depends upon the load; and if such a test were to be included in a standard specification, it would be necessary to arbitrarily specify the load per square centimetre.

It is also interesting to note the difference between aluminous and siliceous bricks. The difference between the softening temperatures conducted under standard conditions and the apparent squatting temperature under a load is wider with siliceous than with aluminous bricks. Otherwise expressed, suppose that two bricks, having the same softening temperature—one aluminous and one siliceous—be gradually heated on a rising temperature, the aluminous brick will begin to collapse under a load at a lower temperature than the siliceous brick. A siliceous brick is inclined to collapse suddenly, without warning, in the vicinity of its softening temperature, while with aluminous bricks the collapse takes place much more slowly.

It is necessary to have a firm grasp of the fact that the vitrification of clay is a time-reaction before the refractory test can be properly understood and the results applied to useful purposes. Similar remarks apply to the contraction test. But a new idea must now be introduced. The manufacturer arrests the process of vitrification during the firing of his goods when he considers that they have been fired long enough. The gas engineer naturally wishes to know if the manufacturer has arrested the reaction too quickly. Remembering that the progress of the early stages of the reaction can be roughly determined by the linear contraction, it is obviously necessary to fire the goods long enough and at a temperature high enough to prevent any marked after-contraction when the refractories are in use. If the contraction has not proceeded far enough during the firing or burning of the goods, then the contraction will afterwards continue at an appreciable rate when the temperature conditions are favourable. This will of necessity give rise to movements in the masonry of the furnace and settings. To test roughly if a fire-brick has been sufficiently fired, the brick can be broken in halves—one half preserved for reference, and the other fired for some time in the furnace similar to that in which the bricks are to be used. If the two portions be afterwards compared side by side, a fairly good idea can be obtained as to how the brick will subsequently behave. In the gas engineers' specification, the linear contraction of a brick which has been heated to a temperature corresponding with the squatting of cone No. 14 for a couple of hours is measured. The test is much more difficult to conduct accurately than the refractory test.

The Porosity of Gas Retorts, &c.

It has been proved that, with most types of fire-clay goods, the more porous the texture, the less the tendency to crack and split with abrupt fluctuations of temperature. A body with a close compact texture is usually very much more inclined to crack or dunt when exposed to sudden variations of temperature than an open-textured body. If clay alone be employed in manufacturing (say) a gas-retort, the component particles of the clay sinter so as to form a body which is not usually well adapted for resisting temperature changes. Certain types of fire-clay are particularly liable to furnish bodies which crack and dunt. Each clay, indeed, has a special character of its own, which requires some special humouring in order that it may do its work to the best advantage. The fire-clays which vitrify at a comparatively low temperature, and yet, on account of their great viscosity, show a high refractoriness, are usually very difficult to work into satisfactory refractory products, especially if another clay, suitable for tempering, be not close at hand. I have in mind a fine clean, white-burning clay which squats at cone No. 33, but is afflicted with the grievous fault of cracking if bricks made from it are abruptly cooled.

The most general and satisfactory method of preventing a clay from misbehaving in this way is to use grog.* In general terms, it may be said that the greater the proportion and average grain size of the grog (1) the less the tendency of the goods to split and crack with abrupt changes of temperature, and (2) the less the binding power and crushing strength of the goods. To produce the best results, a balance of the two opposing qualities is necessary, and the right proportion and grain size of the grog must be decided by the manufacturer, because, as I have previously emphasized, each clay has its own peculiar appetite for grog, and the two opposing qualities must be balanced to a nicety. Very roughly, it may be said that, other things being equal, the greater the proportion and size of the grog, the greater the porosity. Hence, as a rough guide, based on the porosity determination of a large number of typical British and Continental refractories, the Gas Engineers' Committee tentatively specified certain minimum limits. Curiously enough, the problem was quite misunderstood by a small number, who zealously tried to fall in line with the specification, but went to the other extreme with disastrous results. The binding power of the resulting retorts—highly charged with coarse-grained grog—was fatally low. The retorts were so fragile that they could scarcely survive a railway journey without disintegration. The grog question, including the porosity test, is perhaps the most debatable part of the specification. Probably no one realized this more than its founders. A highly porous structure is very

* The term "grog," by the way, appears to be an elliptical form of "grogran" or "grogram," which in turn is derived from a French word meaning coarse-grain. "Grog" is a technical term applied to a granular mass of fired clay which is used for tempering clays. The grog may be prepared either by firing and subsequently grinding raw clay, or by simply grinding fire-clay goods. It may or may not be mixed with ground potsherds, sand, &c.

dangerous if special attention has not been paid to its effect on the tendency to disintegration and binding power.

Porosity and the Conductivity of Heat.

Another objection has been raised against high porosity. It is said that a highly porous structure will reduce the heat-conductivity of a retort because the dead air-spaces in the pores will act as an insulating medium. I may be wrong, but the truth appears to me to be rather different. We must clearly distinguish between high and low temperature thermal conductivity. When it is stated that a high porosity is inimical to the flow of heat through the walls of a retort, the effect of the radiation of heat across the pore spaces is forgotten. It is usually considered that the amount of heat which traverses a slab of unit thickness in unit time is $k\ (T - T_o)$ calories per unit surface, when T represents the absolute temperature of the hot side, and T_o that of the cold side of the slab. The amount of heat exchanged by radiation between a hot and a cold surface in unit time is $k^1 \left(T^4 - T_o^4\right)$ calories per unit surface. For fire-clay, the value of k is nearly 0·0025 and of k^1 nearly 8×10^{-11}. Consequently, at a little below dull-red heat the amount of heat radiated across an air-space from unit surface in unit time will be equal to that which would traverse a fire-clay slab of unit thickness in the same time. The insulating properties of air thus break down in the vicinity of dull redness, and at higher temperatures the air spaces behave as if air were a good conductor of heat. Unless something has been overlooked, *it is therefore inferred that a high porosity favours the passage of heat through the walls of a gas-retort at temperatures exceeding dull redness.*

The Ultimate Composition of a Retort.

A close relation between the ultimate composition of a clay and its general properties has not yet been discovered. Similar remarks apply to fire-bricks and related materials generally. Hence one or two have jumped to the other extreme, and, with more impetuosity than logic, have said: "It is almost useless to have an analysis made of a clay." Statements like these can only come from men inexperienced with proper analyses. About a month ago, an analysis of a Colonial clay was sent to me. It ran: Silicate, 57 per cent.; silica, 30 per cent.; water, 13 per cent. This needs no further comment. You will find a number of analyses of different types of clay collected at the ends of some of the books. It is, perhaps, time they were abandoned. Most have done service in that capacity for scores of years, and the analyst has really made a little progress since they were done. Some curious blunders have also crept in by frequent re-copying. Our conclusions must be based on reliable analyses, or they are worth nothing. For instance, several statements about the proportion of alkalies and of "iron" in our fire-clays have crept into the literature which are inexact, probably because they have been based upon wrong analyses. For example, there are excellent fire-clays with the equivalent of over 3 per cent. of ferric oxide, and some with over 2 per cent. of alkalies. If I were to attempt to discuss this subject more fully, it would be necessary to go into many details for which there is no time.

The ultimate composition of typical fire-clays has undoubtedly a close relation with their physical properties, particularly when goods made from the clays are heated to a point where vitrification is well in progress. If incipient vitrification or sintering alone occurs, then the texture—the physical structure—must obviously be a more important factor than ultimate composition; and, with our present knowledge, it would not be always safe in such cases to predict exactly what would happen from the chemical analysis alone. The vitrification or the mutual solution of the different particles which make up a brick must be largely dependent on the intimacy with which the particles are brought into contact. The finer the particles, the more intimate the contact and the more rapidly will vitrification proceed. These remarks hold good whatever be the composition of the brick.

The Texture of Gas-Retorts.

Microscopic examination of the structure of typical retorts, British and Continental, shows that the grog is surrounded by a more or less homogeneous clay. If clay be employed without the grog, the retort appears quite homogeneous under a low magnification. When the retort has been fired for a certain time, the grog and clay all tend to form a uniform vitreous mass. The relation between grog and clay is a manufacturing problem which need not be here discussed beyond saying that everything indicates that the answer to the question raised at the beginning of the lecture: "Is the manufacturer getting the best results out of his clays?" will largely turn on the relation between the clay and the grog during firing, and that this in turn must largely depend on the character of the grog, and on the way in which it and the clay are mixed together. The grog is the framework or skeleton, and the clay forms the flesh of a refractory. When the grog is specially made by firing the clay, there can be but a relatively small difference between the two, and the two are the more nearly alike, the lower the firing temperature used in the preparation of the grog. When the difference between the grog and the clay is small, the two virtually merge into what appears to be an almost uniform mixture during a prolonged firing when the refractory is in use.

[The lecturer showed a series of photographs of sections of retorts, and pointed out their special features, and said that for the further development of the subject he must refer his hearers to papers he had published. He added that there were many complications, some of which were still under investigation.]

The Action of Flue Dust.

A gas-retort built with a very good refractory material which softened at cone No. 32 was heated by gas carried by short flues from a producer immediately below. When everything was in working order, a fused slag continually dripped from the bottom of the retort, so that the flues leading from the producer were choked with a fusible ferruginous slag. The fused slag had to be removed at intervals. I believe that the gas engineer was, and is now, absolutely convinced that the "iron" in the slag comes from the refractory itself. Let us test the hypothesis. The refractory itself, so far as one can tell from mere inspection, seemed quite satisfactory. It had the ultimate composition:

Sample of Refractory Material Dried at 109° to 110°.

	Per Cent.
Silica (SiO_2)	64·1
Titanic oxide (TiO_2)	1·7
Alumina (Al_2O_3)	29·4
Ferric oxide (Fe_2O_3)	2·5
Magnesia (MgO)	0·4
Lime (CaO)	0·2
Potash (K_2O)	1·1
Soda (Na_2O)	0·7
Loss on ignition	0·1
	100·2

Softening temperature, cone 32 (1710° C.).

The fuel ash from the producer had the ultimate composition:

	Per Cent.
Silica (SiO_2)	30·5
Titanic oxide (TiO_2)	1·1
Alumina (Al_2O_3)	15·8
Ferric oxide (Fe_2O_3)	28·2
Magnesia (MgO)	0·6
Lime (CaO)	4·1
Potash (K_2O)	1·9
Soda (Na_2O)	1·2
Sulphur trioxide (SO_3)	5 8
Loss on ignition (carbonaceous matter)	10·2
	99·4

Softening temperature, cone No. 4A (1160° C.).

The phosphoric oxide was not determined. One sample of the slag—fairly typical—had the ultimate composition:

	Per Cent.
Silica (SiO_2)	45·4
Titanic oxide (TiO_2)	1·2
Alumina (Al_2O_3)	21·0
Ferric oxide (Fe_2O_3)	25·0
Magnesia (MgO)	0·5
Lime (CaO)	2·8
Potash (K_2O)	2·6
Soda (Na_2O)	1·0
	99·5

Softening temperature, cones Nos. 4A 5A (1170° C.).

The amount of iron oxide calculated as ferric oxide in different samples of the slag varied from 20 to 25·5 per cent. The slag is thus not very different from a mixture of a very small amount of he refractory material with a large quantity—perhaps 95 to 99 per cent.—of fuel ash. This is confirmed by determinations of the softening temperatures of artificial mixtures of the powdered retort and the fuel ash. The refractory material may be derived in part from the retort and in part from the fire-bricks of the flues.

Powdered retort (new)	100,	80,	60,	40,	20,	0 p. ct.
Powdered fuel ash	0,	20,	40,	60,	80,	100 ,,
Softening temperature	37,	19,	11,	7,	6A,	4A cone
,, ,,	1710,	1520,	1320,	1230,	1200,	1160° C.

These results show that ordinary fire-clays are very sensitive to the presence of admixed iron compounds under reducing conditions. The reducing action, of course, was produced by the carbonaceous matter in the fuel ash. The large amount of iron in the slag cannot come from the clay, unless a process of synthesis or transmutation be at work, which vies with any of those reported by Sir William Ramsay. The only satisfactory interpretation of the slagging is that the stream of producer gas beating about the retort brings the lower oxides or silicate of iron, as flue dust, into intimate contact with the refractory material, when: (1) the two materials interact, glazing the surface of the retort with the slag in question; and (2) since the producer or flue dust is probably fused before it comes in contact with the retort, it readily sticks on the exposed surface, also covering or glazing it with a fused skin of fuel ash. The glaze gradually becomes thicker, for it is continually fed with more flue dust. Ultimately

the glaze begins to trickle down, carrying with it in solution a a minute quantity of the retort. If very much of the retort were dissolved by the fused glaze (fused flue dust), the life of the retort would extend over a very short period. The reaction would probably be not very different with a silica retort. The natural remedy is to use a fuel with a less fusible ash, or to clean the producer gas free from dust before it comes in contact with the retort or both.

[The lecturer concluded by expressing his indebtedness for assistance given to him in the preparation of the lecture.]

DISCUSSION.

The CHAIRMAN (Mr. T. Banbury Ball, of Rochdale) said he was sure the members had listened with a great deal of interest to Dr. Mellor's remarks. It would, he thought, be absurd to attempt any criticism of them at the moment; but the lecturer would deal with any points needing elucidation.

The President (Mr. W. L. Heald, of Preston), Mr. J. W. Thornley (Salford); Mr. W. Hill (Stalybridge), and the Chairman subsequently took part in a brief conversational discussion; the lecturer dealing with one or two of the various points raised.

At a later stage in the proceedings,

Mr. W. BUCKLEY (Manchester) observed that until the standard specification for fire-clays was introduced, or until the paper on the subject by Mr. Bywater, before the Institution of Gas Engineers, was read, many gas engineers had not given much thought to the question of refractory materials. Dr. Mellor's lecture had shown them what great care ought to be taken in the manufacture of these materials. He wished to ask whether there was any relationship between the grog added and clay. He understood some clays required more grog than others. He would also like to know whether the making of retorts by hand or by machine had any effect on their life.

Dr. MELLOR stated that an important factor in the softening-point depended upon the load applied. In English fire-clays, the grog was mixed; but in foreign ones they could pick out pieces of grog.

The CHAIRMAN remarked that one point Dr. Mellor made might have some bearing on the question as to why the standard specification failed—that was, because manufacturers had not taken particular note of the time for heating the refractory material. Vitrification taking place in two hours would give different results from those obtained if the heat were more gradually applied, and took forty hours.

SULPHATE OF AMMONIA MANUFACTURE.

Oxidation of Sulphite by Catalysis.

The oxidation of ammonium sulphite by oxygen or atmospheric air takes place so slowly when the salt is in solution, that it is usually preferable to convert it first into a solid. The Badische Anilin- und Soda-Fabrik have found that oxidation is considerably facilitated when the solution is kept constantly alkaline by means of oxygen or air in the presence of substances capable of acting as vehicles for conveying oxygen by catalysis; and they have taken out a French patent [No. 463,487 of 1913] for a process for effecting this. They mention, as suitable vehicles, porous substances like coal, refractory bricks, pumicestone, iron oxides, and manganese peroxide. The process also allows of the employment, in a solid state, of oxygen vehicles or catalyzers soluble in acids.

The simplest way to keep the reaction of the solution alkaline is to introduce ammonia into it continuously or intermittently. Oxidation is preferably effected hot. It has also been found that complete oxidation of the sulphite takes place with particular rapidity if the oxygen or air is made to act under pressure. But even with ordinary atmospheric air it is easily and quickly obtained. The ammonium sulphite solution can be prepared and oxidized in the same appliance. A portion of the sulphite may also exist in a solid form in the liquid utilized. During oxidation this portion will gradually enter into solution and be oxidized. It is claimed for the patentees' process that by it saturated and even supersaturated solutions of sulphate of ammonia can be easily obtained, from which this salt can be directly extracted in a pure solid form.

The following is given as an example of the method of carrying out the process: Into a pressure-resisting vessel there are put some pieces of porous baked earth saturated with manganese hydroxide. The vessel is filled with a concentrated solution of ammonium sulphite containing a slight excess of ammonia, and air at about 80° C. [176° Fahr.] is introduced under a pressure of 20 atmospheres or more. If necessary, a little ammonia can be added to the air to replace the small quantities which escape, and which, besides, can be recovered. The current of air can also be conveyed through two or three vessels placed in succession.

The Junior Institution of Engineers will hold an ordinary meeting next Monday week, when Mr. W. A. Tookey, M.I.Mech.E., will read a paper on "Some Practical Notes on the Running of Gas-Engines and of Gas Producers"—a paper which will be repeated the following Friday at Manchester, before the North Western Section of the Society.

HEATING BAKERS' OVENS BY GAS.

Two Recent French Patents.

It may be remembered that the question of the employment of gas for heating bakers' and pastrycooks' ovens has of late been much under consideration by the Paris Gas Company; and at the last meeting of the Société Technique du Gaz en France, M. Rouland, the Company's Managing-Director, read a paper on the subject, of which a translation was given in the "JOURNAL" [Vol. CXXII., p. 1007]. In it several types of oven-heater were described. There have lately been patented for France two other systems—one by M. Louis Amédée Mousseau and the other by the Société l'Appareil Contrôleur—of which it may be of interest to give some particulars by way of supplementing those furnished in the paper referred to.

M. MOUSSEAU'S SYSTEM.

We will take first the system of M. Mousseau, whose patent is No. 462,047 of 1913. In his specification he points out that hitherto, in the various bakers' ovens heated by ordinary gas, there have been used rows of burners in the baking chamber,

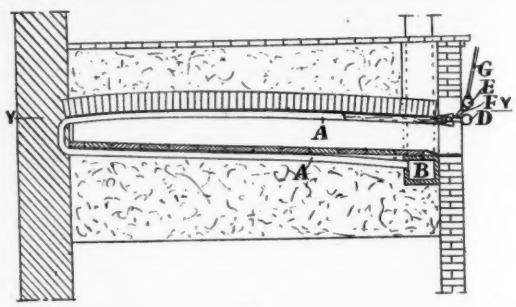


Fig. 1.

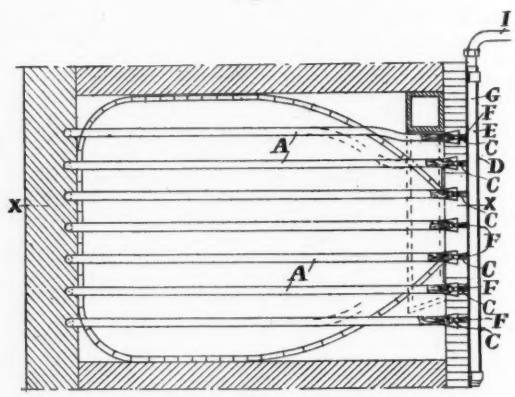


Fig. 2.

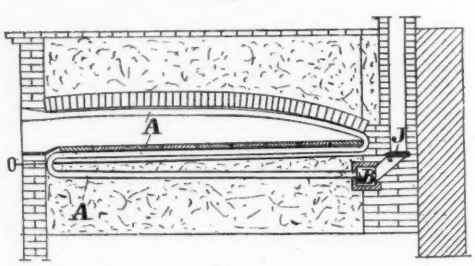


Fig. 3.

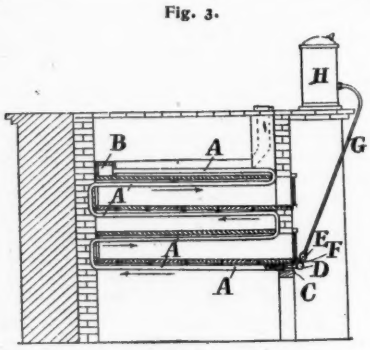


Fig. 4.

M. Mousseau's Baker's Oven.

movable appliances placed in front of the mouth of the oven, or an independent fireplace. Apart from the large consumption of gas entailed, and the inconvenience due to the burners being in the baking chamber, these systems are not very practicable. It is claimed for M. Mousseau's invention that the inconveniences named are remedied, and economy of fuel is ensured. It consists in the arrangement, within the baking chamber, of a series of pipes, inside each of which is drawn a jet of flame produced by ordinary lighting or other gas. These pipes run along the entire length of the chamber, then pass under it, and terminate in one collector connected with the chimney, the suction produced by which draws and lengthens the flames, thereby considerably increasing their heating power. In order to convey the greatest possible amount of oxygen to a burner, each one is connected with an air-injector branched on a pipe communicating with a tank containing air under pressure. This acts as a blow-pipe, and increases the suction of the chimney.

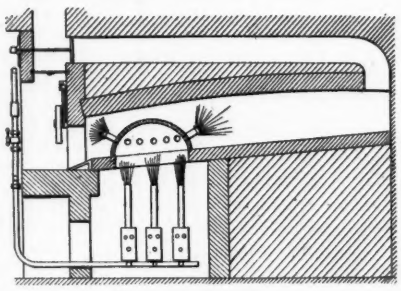


Fig. 1.

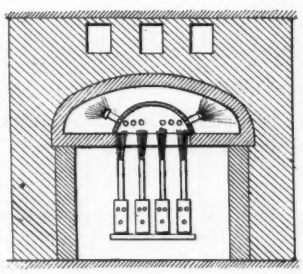


Fig. 2.

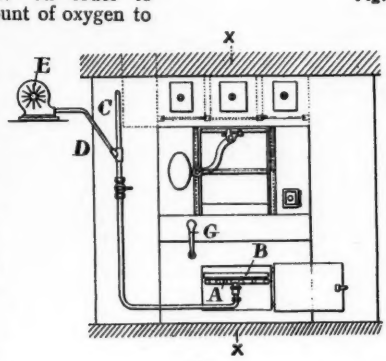


Fig. 3.

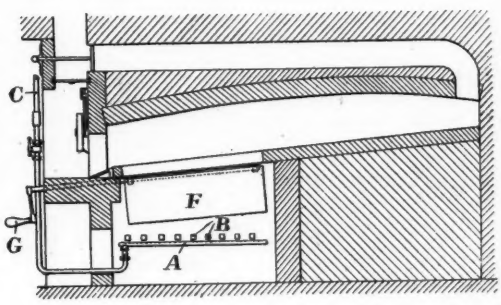


Fig. 4.

The Bakers' Ovens of the Société l'Appareil Controlleur.

The illustrations appearing on p. 650 will assist the reader in understanding the details. Fig. 1 is a part longitudinal section of an oven on the line X of fig. 2, which is a horizontal section on the line Y of fig. 1. Fig. 3 is a part longitudinal section similar to that of fig. 1, but showing the pipes placed in another part of the oven. Fig. 4 illustrates the invention as applied to an oven having two superposed baking chambers.

A are heating-pipes, B the collector or suction passage connected with the chimney, C the burners, D the pipe carrying and feeding the burners, E the air passage, F the air-injector, G the pipe conveying air under pressure from the tank H (fig. 4) to the injectors, I the pipe conveying gas from the source of supply to the pipe D. The pipes are fixed on the front of the oven, so as not to interfere in any way with opening or closing, or with access being had to it. A damper J, worked from the front of the oven, serves to regulate the suction of the chimney. The pipes are furnished with taps to admit or cut off the gas or air. There may be one for each burner, or only on the pipes D and E.

M. Mousseau's system of heating is applicable to the different types of ovens already built. The number of heating-pipes running into the baking chamber will vary with its size. They may merely go through the chamber and end in the collector, or they may end at the extremity of the chamber and be connected with the air-shaft and chimney. The pipes may be provided with flanges to increase their heating surface. A thermometer or a pyrometer can be placed in front of the oven to enable the baker to ascertain when the temperature inside is suitable.

There has recently been published an addition to M. Mousseau's patent; and it contains several changes which should be indicated. In the later arrangement the patentee makes the pipes run several times through the baking chamber before ending in the collector, so as to effect a more general distribution of the heat. The hot gases are caused to blow under the bottom of the baking chamber, and then pass over its arch; two spaces being made, one above the other and communicating—the higher one ending in the chimney. In the higher space is placed an air conduit, drawing air from outside, and terminating in a tank feeding a series of nozzles conveying the hot air to each corresponding burner. Near the arch of the baking chamber, and over its entire surface, there is constructed a hollow ceiling or heating compartment, made either of metal or refractory material, forming between the arch and its side a narrow space, which receives the flames from the burner-pipes running for only a short distance into it.

System of the Société l'Appareil Contrôleur.

This system, which is the subject of patent No. 462,132 of 1913, is intended to replace wood or coal fires for heating bakers' or pastrycooks' ovens without necessitating any material alteration in their structure. It is claimed for gaseous fuel that it is infinitely more economical than either of those just mentioned, as the burners have simply to be lighted when required, and extinguished when the proper temperature has been attained. This occupies very little time, and no impurity, such as fragments or cinders, can get into the oven, as is the case with wood or coal. The heating appliance consists of a row of burners placed in the same position as the grate of an ordinary oven, and having above them bars of refractory material, or a group flames projecting into a cavity perforated with holes in the bottom of the oven.

The illustrations given above are an example of the invention. Fig. 1 is a vertical section of the burner arrangement; fig. 2, a transverse section through the fireplace; fig. 3, a front view of an oven of the ordinary shape fitted with a variant of the invention consisting of a row of gas-jets; and fig. 4, a longitudinal section of the same oven on the line X of fig. 3.

As will be seen from figs. 1 and 2, the first system consists of several burners fixed in the fireplace of the oven either horizontally or vertically, so as to project their flames into a cavity made in the bottom. Over this cavity there is a cupola or dome of refractory material, having openings through which the flames are projected into the oven on all sides and regularly, so as to heat it uniformly. In order to avoid accidents which might occur through the gas-meter supplying the burners becoming clogged, stopping, and then starting again automatically, the flash-light for igniting the burners is fixed on a separate pipe from that conveying gas to the meter.

The second arrangement, shown in figs. 3 and 4, consists of a row of gas-jets A, rods of refractory material B which can be fixed vertically upon the gas-pipe, which is connected with a pipe C branched on an intake-pipe D for air supplied by a small blower E. The mixture of gas and air burns between the rods with a very blue flame, and with forced draught produced by the oven chimney. In order to apply the arrangement to an oven burning wood, the range of gas-jets should be placed in a cavity, and surmounted by a dome to project the flames in the required direction. For ovens heated by coal, the opening for the fireplace, which, after heating up, is usually covered with an iron plate, can with advantage be closed by two refractory tiles F, moved by a crank G. Consequently there will be no break in the floor of the oven and this will allow of a few extra loaves being put in. The fire place can be raised and lowered by means of an endless screw.

Institution of Petroleum Technologists.—At the inaugural meeting of this Institution, which was held at the Royal Society of Arts last Tuesday, Sir Boverton Redwood (the President) pointed out that their aims were to enable technologists engaged in the petroleum or shale oil industry to meet, correspond, and accumulate trustworthy information regarding the production or winning of petroleum and oil-shale, the conversion of the raw materials into manufactured products, and the characters and uses of these products, together with their transport and storage; and, in the second place, to promote the better education of all persons desirous of becoming professional consulting petroleum technologists, engineers, geologists, or chemists, and to elevate the professional status of those employed in the industry by setting up a high standard of scientific and practical proficiency, and by insisting upon the observance of strict rules in regard to professional conduct. Addresses were given by three members of the Council—one of them Professor Vivian B. Lewes, who said the demand for low-flash spirits as motor fuel exceeded the supply, and the need for lubricating oil had grown *pro ratâ* with the use of petrol. While the demand for the production of crude oil available as petrol, fuel oil, and lubricants had quadrupled the last eight years, the world's supply of crude oil had not doubled within this period. The continued demand for oil as an illuminant was shown by the quantity of kerosene imported into this country last year having formed 35 per cent. of the total imports of oil.

THE INDUSTRIAL USES OF COAL GAS.

By H. M. THORNTON, J.P., of the Richmond Gas Stove and Meter Company, Limited.

[A Lecture given in Newcastle, on March 5, under the Auspices of the Newcastle-upon-Tyne and Gateshead Gas Company.]

There was a large attendance of gas managers and engineers, manufacturers, works' foremen, &c., at Tilley's Rooms, Market Street, Newcastle-on-Tyne, last Thursday afternoon, to hear the lecture by Mr. H. M. Thornton, J.P., Vice-Chairman and Managing-Director of the Richmond Gas Stove and Meter Company. The lecture had its origin in the paper which Mr. Thornton delivered at the annual conference of the British Commercial Gas Association in London last October. It was addressed to the gas industry; and in the course of it attention was drawn to the wide field that existed for the use of gas for industrial purposes, illustrating a hundred different processes using gas, and concluding with an appendix of 200 different industries or trades in this country at present known to be using gas. Among other suggestions for developing the use of coal gas as an industrial fuel, Mr. Thornton advocated public demonstrations of industrial appliances, to which manufacturers, traders, &c., in the district should be invited to receive information and to view practical demonstrations. The Newcastle and Gateshead Gas Company, through their Secretary, Mr. T. Waddom, almost immediately after the publication of the paper, invited Mr. Thornton to give a lecture. Invitations were sent by the Gas Company to factories and works in the district, to secretaries and engineers of gas companies in the area of the North of England Gas Managers' Associations, professors and students at Armstrong College, and the Newcastle District Association of Foreman Engineers and Draughtsmen. Sir William H. Stephenson, the Chairman of the Newcastle and Gateshead Gas Company, was to have presided. He was, however, unable to be present. In his absence,

Alderman PENMAN, of Gateshead, presided. He thought he would be expressing the earnest wish of all present when he said he trusted that the development which had already taken place in the gas industry would be still greater in the future. If they could see the same improvement in the use of gas for heating and power as had already been achieved in lighting, the future of gas and gas undertakings would be very successful, and be of great benefit to the commercial and industrial interests of the whole country.

MR. THORNTON'S LECTURE.

Mr. THORNTON then delivered his lecture as follows:

At the annual conference of the British Commercial Gas Association in October last, I read a paper on "The Use of Gas for Industrial Purposes;" and the widespread interest evidenced at that time and since has shown how deeply the subject is engaging the attention of the manufacturing world. On the occasion referred to, my object was to give general information in regard to the many uses to which gas has been, or can be, applied for industrial purposes; and it is exceedingly gratifying to the gas industry to note that practically every trade, with but few exceptions, employs gas in some form or other in the processes of manufacture. I am convinced that we, as a nation, would be less able to maintain our high position in the commercial world if we had not succeeded in applying such a potential heating agent as gas, in so many ways, to the service of industry.

The continued increase in the consumption of gas for industrial work by the well-known progressive manufacturers in this and other countries shows clearly that it is regarded as being either more economical than other fuels for many heating purposes or that the work is accomplished better and more quickly. As a matter of fact, it is because gas is found to be both more economical and more satisfactory in its results than other fuels, that its use is becoming increasingly popular.

Sir William Ramsay and many other leading scientists advocate the extended use of gas in its various forms. "Save coal!" is Sir William's warning cry; and as one of our technical journals remarked in a recent issue:

> "In the middle of the last century, and, indeed, for long afterwards—partly because it was cheap, and partly because the fact was not realized—coal was being used with a prodigal wastefulness which, under changed conditions, and in the light of later knowledge, seems almost criminal. Since then we have both learnt much and done much – not only in the way of economizing in the direct consumption of coal. We have also learnt how to make it go further, by resorting to indirect methods (as in the use of the gas-engine, and in the adoption of many processes, both domestic and industrial, in which gas is employed); how to utilize profitably what was largely waste from the mines; and how to recover and turn to the benefit of civilization the valuable bye-products of coal upon its distillation for metallurgical coke. Nor is this all. We have even learnt how to turn to profit the waste gases of combustion in coke-ovens and furnaces; and so have directly done away with the need for coal for important purposes where conditions are favourable."

The day is coming, and not far distant, when the gas industry will more and more avail itself of the storage and distribution of coke-oven gas. When this becomes an accomplished fact in this country—as it has already become in Rhenish-Westphalia on a large scale—then gas, popular as it is for industrial work, will be used for the very largest furnaces which at present are fired with hard fuel.

Now, before passing to the application of gas to industries of more definite local interest, I will very briefly mention and illustrate how gas is used in some industries of national importance.

INDUSTRIAL GAS APPLICATIONS OF NATIONAL INTEREST.

We are well aware how much we rely for our prosperity upon the cotton and woollen industries; Lancashire and Yorkshire between them supplying the whole world with their manufactures in some form or another.

COTTON.

When gas is used for the purpose of thread singeing, the thread is automatically wound off a bobbin, and passed through a naked gas-flame on to another bobbin at the rate of 200 yards per minute—the single threads or strands being burnt off (singed) in the process. Since the introduction of the present gas method, the improvement in the quality of the material, and in other directions, has been considerable. A machine will use about 300 cubic feet of gas per hour; and it will, therefore, be understood how great is the consumption of gas throughout the County Palatine for this one industry alone.

CLOTH INDUSTRY.

Fig. 1 gives some idea of the gas appliances used in the cloth industry. Here we see the material being singed. This process consists in burning-off all the nap and loose threads from the cloth. It is the first stage in the preparation of the cloth for bleaching, dyeing, printing, and finishing; and in this way the surface of the cloth is prepared for the various finishes which it is desired to obtain, and made suitable for being printed upon. The cloth is passed over gas-burners at a speed varying from 80 to 200 yards per minute, according to the class of goods being treated. It is then run through water to extinguish sparks, and is left in the wet state until it undergoes the subsequent operations of bleaching or scouring. The machine is made specially for use with gas by the largest manufacturer of textile machinery. The consumption varies according to the quality of the cloth and the number of the gas-burners used; but a single-burner machine, with ordinary width cloth, consumes from 200 to 250 cubic feet per hour.

Tentering is the stretching of the cloth. To enable this work to be carried out more effectively, the cloth is first moistened by being passed through or over a steaming-chamber or damping-box. It is then clipped at each side, stretched, and passed through the machine at an average speed of 40 yards per minute. In its passage through the machine, it passes over gas-flames, above which is placed a copper sheet, which, when heated by the gas, drives the steam and moisture out of the cloth.

GLASS INDUSTRIES.

Another of our big industries, the glass manufacturing trade, is well represented in this district. Here, again, gas is found to be of marked advantage over other fuels—used in a furnace known in the glass trade as a "Glory Hole." At Gateshead and Sunderland, several of these modern and up-to-date gas-furnaces are at work, and many others in different parts of the country. During

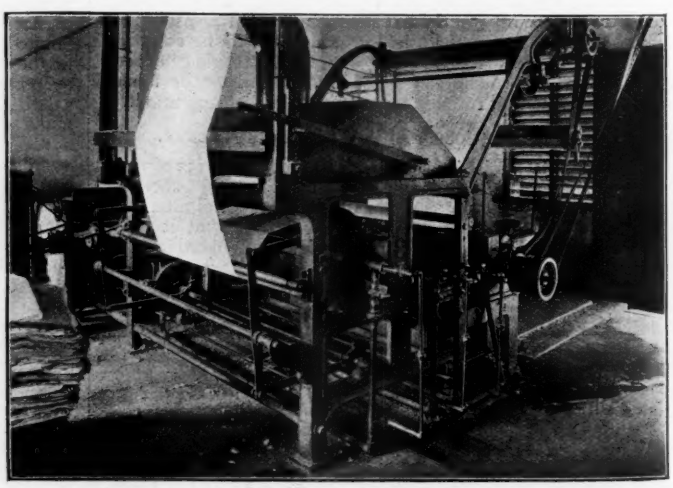


Fig. 1.—Cloth Singeing Machine for Removing Nap and Loose Threads.

the operation of glass-blowing, the glass under process of formation, after leaving the melting pot from which the molten "metal" is obtained, requires reheating to maintain it in a plastic condition; and it is for this purpose that the "Glory Hole" is used. These furnaces are also used for obtaining a good finished surface on moulded glass-ware.

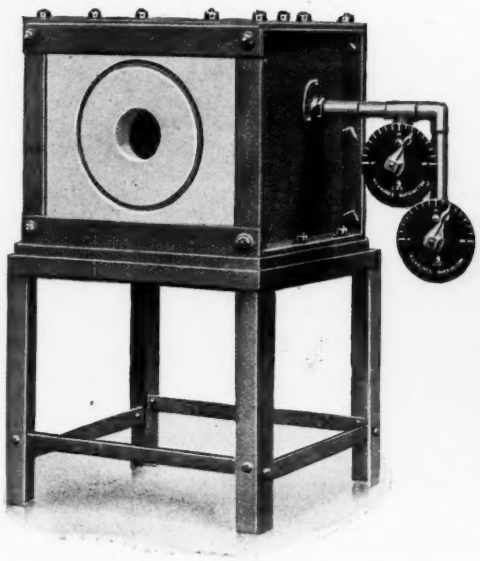


Fig 2.—Richmond Self-Contained "Glory Hole" Furnace.

Fig. 2 illustrates a small self-contained and portable "Glory Hole" furnace. It will be seen that it has a circular chamber. The smaller size furnaces are fitted with one cyclone burner; the cyclone flame encircling around the furnace chamber. In the larger sizes a double cyclone burner is used, and the spiral flame heats up the surface of the brickwork, which is left rugged so as to absorb the heat and increase the radiant efficiency of the furnace. Glass introduced into these "Glory Holes" is free from flame contact.

As soon as a glass-blower has finished his work on an article, it is immediately transferred, while hot, to a low-temperature furnace, to allow of its gradual cooling or annealing. These furnaces (known as the Lehr type) are usually from 40 to 70 feet long; and about one-fourth of the length is heated by town gas to a scarcely visible red temperature. The hot gases from this portion of the furnace travel through the remaining length; thus giving a graduated heat. The articles are placed in the warm end of the furnace, and (carried on rectangular iron trays, attached to one another) travel down very slowly towards the cool end. The trays are drawn along by a hand-winch with ratchet; the speed being 2 feet every 40 to 60 minutes, according to the class of work.

Manufacture of Tool and High-Speed Steel in Bar.

Now let me direct your attention to the application of gas to another of our important industries. The North-Eastern District is considered the home of the greater engineering industries, where tool and other kinds of alloy steel for all descriptions of machine work are used in great and varying quantities.

Although the steel industry is confined to one or two localities —notably Sheffield and district—it is so important to the engineering trades universally that one of the latest methods and practices in manufacture will, I am sure, be of interest.

I refer to annealing, which is one of the principal processes in the production of the kinds of steel just mentioned. The manufacturer of high-class steel is increasingly requested to quote for it in the annealed condition. This operation is performed by slowly heating the steel to a red heat (the exact temperature depending on the nature of the steel), and afterwards allowing it to cool very slowly. The whole operation is, so far as it is possible, carried out in the absence of air.

The older method was to pack bars, 15 feet (or thereabouts) in length, into an iron box, along with charcoal. The box was placed in a furnace, which was heated by coal to the required temperature. The operation took from 36 to 48 hours. The fire was then left to die out; the box and its contents consequently cooling very slowly. The charge was then withdrawn in from three to five days from the start. It will be seen that the process was relatively a slow one; two heats per week being the maximum capacity of such a furnace.

Industry progresses both in its inventions and its economies. An invaluable saving of time and cost (not to mention improvement in annealing) is now achieved by means of the Richmond gas-heated regenerative natural-draught oven-furnace, as shown in fig. 3. These gas-furnaces will anneal ordinary carbon and high-speed steel, in charges of 2 tons and upwards of bar steel, in 48 hours from start to finish, using town gas as fuel, without the use of the protecting box before described—the steel bars being simply placed on the fire-brick floor of the gas-oven. This method is now in use in many of the large Sheffield steel-works. The interior dimensions of the furnace illustrated are 15 ft. 9 in. long, 2 ft. wide, and 1 ft. high. Its capacity is 2 tons of bar steel. The heating is accomplished by a number of special (patented) gas-burners.

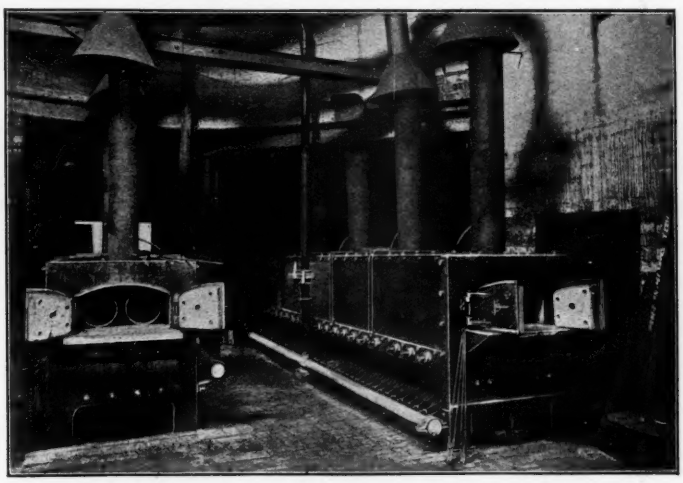


Fig. 3.—Two Richmond 16-feet Steel Bar Annealing Furnaces, Regenerative Type.

Let me briefly summarize the method of working the furnace. The bar steel is charged into the furnace, beginning at (say) 9.30 a.m. All the dampers are opened; and the air-slides on the burners are closed. Then the first burner is lighted, and immediately, in rotation, each burner-tap is turned on, and the gas lights itself automatically. Then the air-slides are adjusted for a proper mixture of gas and air, at the ordinary town-gas pressure. The furnace may now be left to take care of itself for about two hours. After the expiration of this time, a pyrometer is read every ten to fifteen minutes, until the maximum temperature is obtained. On attaining this temperature, every alternate burner is shut off, and the charge is thoroughly "soaked" for about two hours; half the burners only being necessary to maintain the heat. Then the remaining burners are gradually shut off in order to give a gradual falling temperature, after which all slides and dampers are closed, and the furnace is left to cool down. The temperature and the length of soaking required will depend entirely on the nature of the steel. After about 48 hours from the first lighting, the charge can be withdrawn.

The following are figures of actual working:—

Annealing Steel in Richmond's Regenerative Gas-Oven Furnace.

	Carbon Steel.		High-Speed Steel.
Weight of charge	35 cwt.	..	45 cwt.
Total time of heating	6 hours	..	9 hours
Time of cooling	42 ,,	..	40 ,,
Total time of operation	48 ,,	..	49 ,,
Maximum temperature attained	880° C.	..	874° C.
Gas consumption per ton of steel	3600 c. ft.	..	5000 c. ft.
Cost of gas per ton of steel annealed, on the Newcastle Gas Company's industrial tariff	5/7½	..	7/9

Incidentally, I may mention that a Sheffield manufacturer found that the gas-furnace described was so economical in its

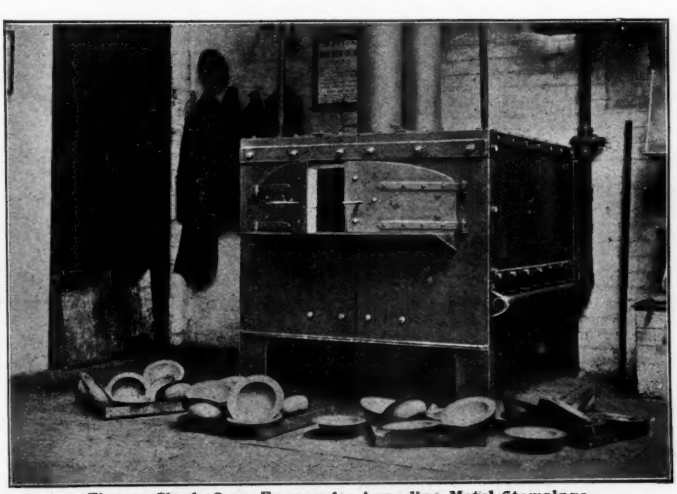


Fig. 4.—Single Oven Furnace for Annealing Metal Stampings.

working that it saved its initial cost (about £200) within the first six months.

Steel annealed in this type of furnace is practically free from scale, and can be obtained in quite as soft a state as from a coal-fired furnace—in fact, the annealing is, if anything, more uniform. This, in addition to the time and space saved, and, as already mentioned, the omission of the packing-boxes, proves the economy of gas.

Annealing Processes in the Metal Industries.

Before considering the many uses of manufactured steel, and the importance of gas in the numerous processes to which steel is subjected by engineering and several other industries, let me briefly, before we pass from the question of annealing, show some illustrations of general annealing carried out by gas.

A single gas-oven furnace for annealing metal stampings is shown in fig. 4. For this purpose gas is being increasingly used; and where the metal stampings are subjected to one or two heats only, a single-oven furnace such as this serves the purpose. Some stampings require to be passed through the pressing or drawing machines four or five times, and need annealing between each operation. For this purpose a twin-oven furnace is preferable. Such a furnace has two ovens—the top one being used for pre-heating the articles gently before subjecting them to the full annealing temperature in the lower one.

Thermo-Treatment of Steel.

Returning now to the progress of steel bar to the manufacturer of hand and machine tools, gear parts, mining and agricultural implements, cutlery, ordnance materials, electrical appliances, and the manifold component parts of machinery, we come to the processes of hardening, case-hardening, and tempering.

Hardening Temperatures.

The equipment of a hardening shop is of vital importance to all engineering works. This fact is well appreciated; but there are still many who do not realize the advantages of gas-heated furnaces for this work. Of this, steel manufacturers are well aware; and so they generally advise their customers to use gas-furnaces to harden and temper the steel supplied. Let us for a moment consider the reasons for this recommendation. Steel, being an alloy metal, has its crystalline structure consisting of ferrite, perlite, silicon, &c., which become transmuted under different heat treatments, thereby entirely altering the nature of the steel. Tool steel has critical hardening points between 725° and 780° C. or thereabouts; and if hardened at higher temperatures, the result will be unsatisfactory. It will, therefore, be seen that even and exact temperatures are essential; and as even and exact temperatures can be best obtained by gas-furnaces, there can be no two questions as to the type of furnace to adopt.

Other special steel for motor-gearing, &c., also requires the most finely adjusted heat treatment; while high-speed steel is the most difficult of all to harden properly, on account of its high hardening temperature from 1200° to 1260° C. No type of furnace other than that fired by gas can be so implicitly relied upon to give the required uniform and defined temperatures in varying degrees.

Crudeness must, in the cause of progress, give place to refinement. The smith's shop is not the place for the heat treatment of tool steel; and while one may have a really first-rate man for tool dressing and hardening in the smith's shop, the ordinary smith's fire is about the worst conceivable form of furnace for hardening purposes. It is quite impossible to use a pyrometer in a coke-hearth with any success in recording the exact temperature to which the tool itself is exposed.

Mr. Harry Brearley, in his excellent text-book on the "Heat Treatment of Tool Steel," says that a hardening shop very seldom receives the amount of attention that it should. Although some of the clever craftsmen who are to be found in this trade are able to provide temporary expedients, and, with the aid of their own resources, produce really remarkable results with the usual sprinkling of ordinary tools, the ingenuity of such a workman must be enhanced by the provision of specially designed gas-furnaces in the hardening shop. This is confirmed by my own experience.

Suggested Plan for a Small Hardening Shop.

For the benefit of those who may have under consideration the equipment of a moderate sized hardening plant, the following suggestions may be useful. In the first place, the hardening shop should be of sufficient area to allow of comfortable working space around each furnace. Placing a gas-furnace under an open shed should always be avoided, because it is impossible to work with good result in a corner exposed to the wind or other inclement atmospherical conditions. Fig. 5 shows a plan for a small hardening shop consisting of—

(1) A natural down-draught salt or lead bath for hardening carbon steel articles.
(2) A natural-draught furnace for case-hardening, hardening, and re-heating.
(3) A gas and air-blast furnace for hardening milling cutters, taps, dies, &c.
(4) A small gas and air-blast furnace for hardening the noses of planing and other similar tools.
(5) Oil tempering bath (natural draught).
(6) "Boshes" for quenching. If possible, it is desirable that these boshes should be double-cased, with a passage of cold water through the jacket or outer casing, to keep the liquid at a constant low temperature in the "bosh" or tank itself.

Some Typical Furnaces for the Hardening Shop.

It will be helpful to illustrate, and to describe in detail, the particular use of each furnace referred to in the plan, and some others for allied processes.

Fig. 6 shows a salt bath (natural down-draught type) suitable for hardening articles made of carbon steel. The bunsen burners enter the furnace chamber from the top, and the products of combustion are drawn round the pot to the bottom of the furnace. The results obtained have proved this type of furnace to be better than the usual method of firing from the bottom. The life of the pot is increased, while the molten salt in the pot is less liable to chill on the surface.

Fig. 7 shows a Richmond natural-draught oven furnace, which will serve several purposes in the hardening shop—viz.: (A) Hardening carbon steel. (B) Pre-heating carbon and high-speed steel for tool making. (C) Case-hardening (carburizing and re-heating).

(A) Such a furnace, with internal dimensions of 3 ft. by 2 ft. by 1 ft., will take about 45 minutes to heat-up from cold, and will consume during that time about 300 cubic feet of gas to heat the furnace to 750° to 800° C.—the approximate temperatures required for hardening carbon steel. The furnace can then be maintained at that temperature by the consumption of about 200 cubic feet per hour, which, on the Newcastle Gas Company's industrial sliding tariff, would mean only 4d. per hour.

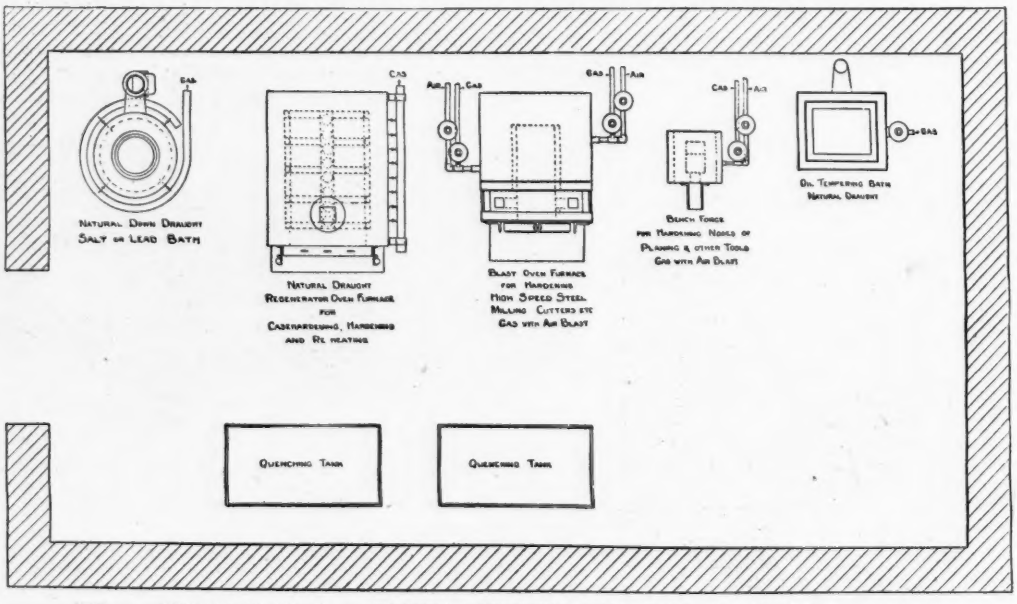

Natural Down Draught Salty or Lead Bath
Natural Draught Regenerator Oven Furnace for Case-hardening, Hardening and Re-heating
Blast Oven Furnace for Hardening High Speed Steel Milling Cutters etc Gas with Air Blast
Bench Forge for Hardening Noses of Planing & other Tools Gas with Air Blast
Oil Tempering Bath Natural Draught
Quenching Tank
Quenching Tank

FIG. 5.—GROUND PLAN OF A MODERN HARDENING SHOP WITH GAS-HEATED FURNACES.

(B) This same furnace is intended for pre-heating high-speed steel at 900° C.; and it will consume about 220 cubic feet per hour.

(C) Again, this furnace is eminently successful and in very extended use for the operations of carburizing and re-heating (case-hardening). For carburizing, the gas consumption will, of course, vary according to the weight and bulk of work, represented by the number and sizes of carburizing boxes and their contents, put into the furnace at one time. A consumption of 300 cubic feet of gas per hour will, however, suffice for the likely amount of work put into the furnace; while, for the subsequent reheating and hardening operations, the consumption will be, as already mentioned, only 200 cubic feet per hour.

Fig. 6.—Richmond Natural Down-Draught Type Salt Bath.

This furnace is fired with gas at the ordinary town pressure; no air-blast or power being required. Fig. 8 shows a cross-section of the furnace. The air necessary to support combustion is highly preheated, by sixteen lateral air-nostrils (eight on each side), before it reaches the combustion chamber, which extends longitudinally and centrally beneath the floor of the oven. The furnace chamber is rectangular in shape, and on the floor of this chamber supports are placed at 9-inch centres, and on these supports a series of tiles (usually 2 inches thick) are placed. These form the floor of the oven, or, in a muffle furnace, a muffle takes the place of the tiles. The dampers are of the hit-and-miss type, and can be regulated to a fine point, producing in an oven-furnace either a reducing or oxidizing atmosphere at will. The flue-pipe supplied gives the correct draught. In this furnace 1350° C. can be reached if required. Hitherto such a temperature in a natural-draught oven furnace has been impossible; and this proves both the efficiency and economy of the furnace when working at the normal temperatures before mentioned.

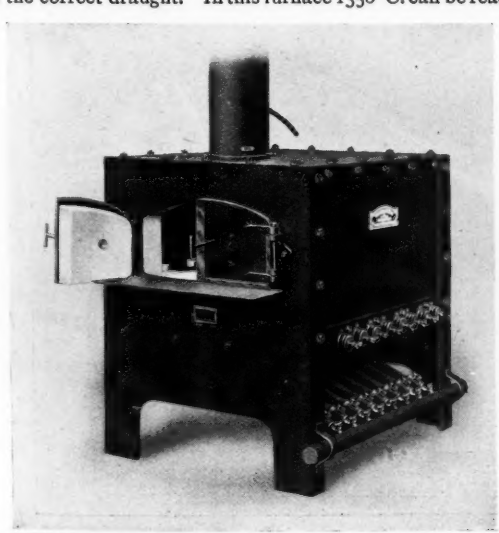


Fig. 7.—Richmond Natural-Draught Oven Furnace.

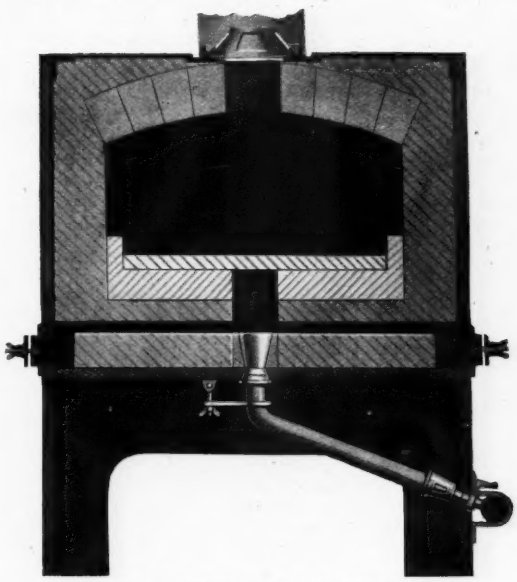


Fig. 8.—Section of the Oven Furnace.

In fig. 9 we have a blast-oven furnace suitable for hardening high-speed steel machine tools—viz., milling cutters, taps, dies, &c. The furnace measures internally 18 in. by 15 in. by 9 in., and will in one hour heat up to 1300° to 1400° C., which temperature can be maintained for about 400 cubic feet of gas per hour, or (say) 7½d. per hour on the Newcastle Gas Company's industrial tariff. The furnace has a rectangular chamber, cased with brickwork; the outer casing of the furnace being of wrought iron and castings strongly braced together. The gas and air-blast burners in this type of furnace enter the top of the furnace. The action of the flame under the arch forms a quarter of a circle and splits itself at the bottom of the furnace chamber, and in this way the air-blast flame does not impinge on the work to be heated up.

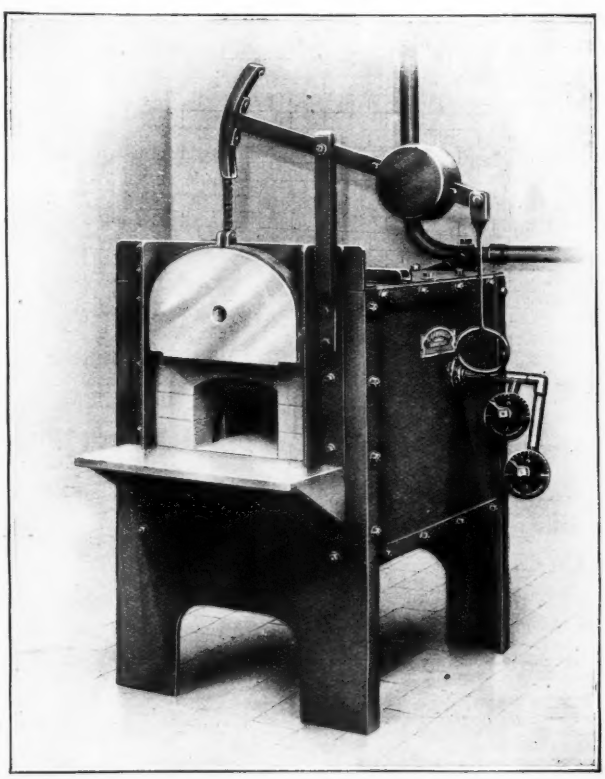


Fig. 9.—Richmond Blast-Oven Furnace.

The furnace flues are constructed in such a manner that, whether the lifting-doors be open or closed, it is possible to work with a reducing atmosphere, which is, of course, a most desirable condition when hardening high-speed steel. The natural-draught oven before mentioned (figs. 7 and 8) is used to preheat

high-speed steel up to 900° C., at which temperature it will be rapidly transferred to this blast-oven furnace, so reaching the hardening temperature of 1200° to 1260° C. as quickly as possible. The reason for this is well known to hardeners. The preheating is in reality an annealing process; and the last heating operation, from 900° to 1260° C. or thereabouts, is to bring the tool up to the high temperature in the least possible time—thereby avoiding the possibility of decarbonizing the surface of the tool, which occurs by too long exposure in the higher heating furnace. The hardening of milling cutters is, in reality, quite a work of art; and for successful hardening the use of a suitable gas-furnace is almost imperative.

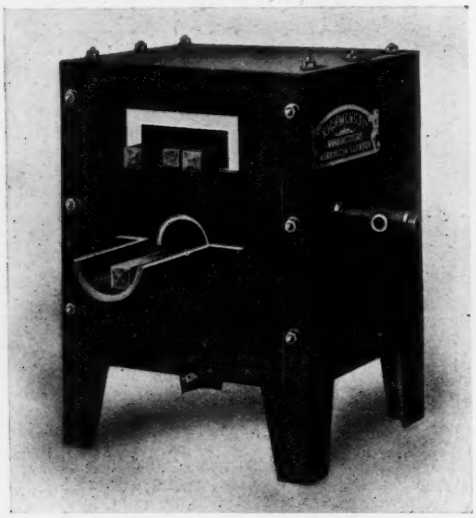


Fig. 10.—Small Twin Gas and Air-Blast Furnace.

We have in fig. 10 an illustration of a small twin gas and air-blast furnace, suitable for hardening the noses of high-speed planing tools; the top-oven being used for preheating, as before described. With this furnace it is possible to obtain really astounding results with a gas consumption of (say) 100 cubic feet per hour, which on the Newcastle Gas Company's industrial rate would amount to (say) 2d. per hour. In the furnace described, the lower chamber measures 6 in. by 3 in. diameter, and the upper one 12 in. by 6 in. by 2 in.; and it will heat up from cold to a temperature of 1300° to 1400° C. in the lower chamber and 800° to 900° C. in the upper chamber in something like twenty minutes. With it, planing tools can be hardened under ideal conditions, and very rapidly.

Fig. 11 shows an oil tempering furnace heated with natural-draught bunsen burners. These furnaces will be found to give the most satisfactory and reliable results when the temper is not required to be shown by colour. A thermometer is placed in the oil or fatty substance which is used for tempering purposes. The tools are submerged in the oil or tallow in a wire basket until the temperature necessary is registered; and they are then quickly withdrawn.

The five furnaces just described are the ones suggested for a medium size hardening shop as indicated on the plan previously shown.

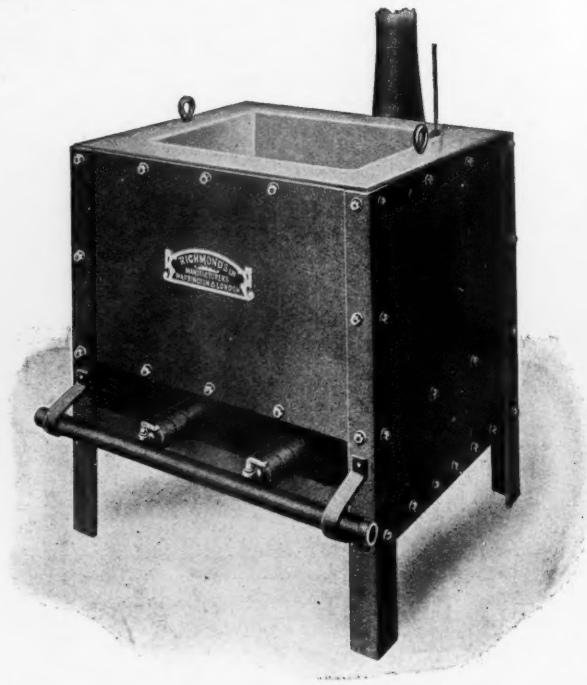


Fig. 11.—Oil Tempering Furnace.

There are many other useful types of furnaces—for instance, a gas and air-blast furnace is made suitable for hardening twist drills in a vertical position. The furnace is fitted with a pre-heating chamber in which the drills are placed in a horizontal position for heating-up to a red heat, after which they are placed in a vertical position and heated up to the hardening heat—about 1260° C. The reason for hardening twist drills in a vertical position is to keep them straight. When hardened in a horizontal position they are liable to warp. The efficiency of this furnace is very high. The pre-heating is accomplished by the waste gases from the furnace chamber.

I could, of course, enlarge on the many types of gas-furnaces

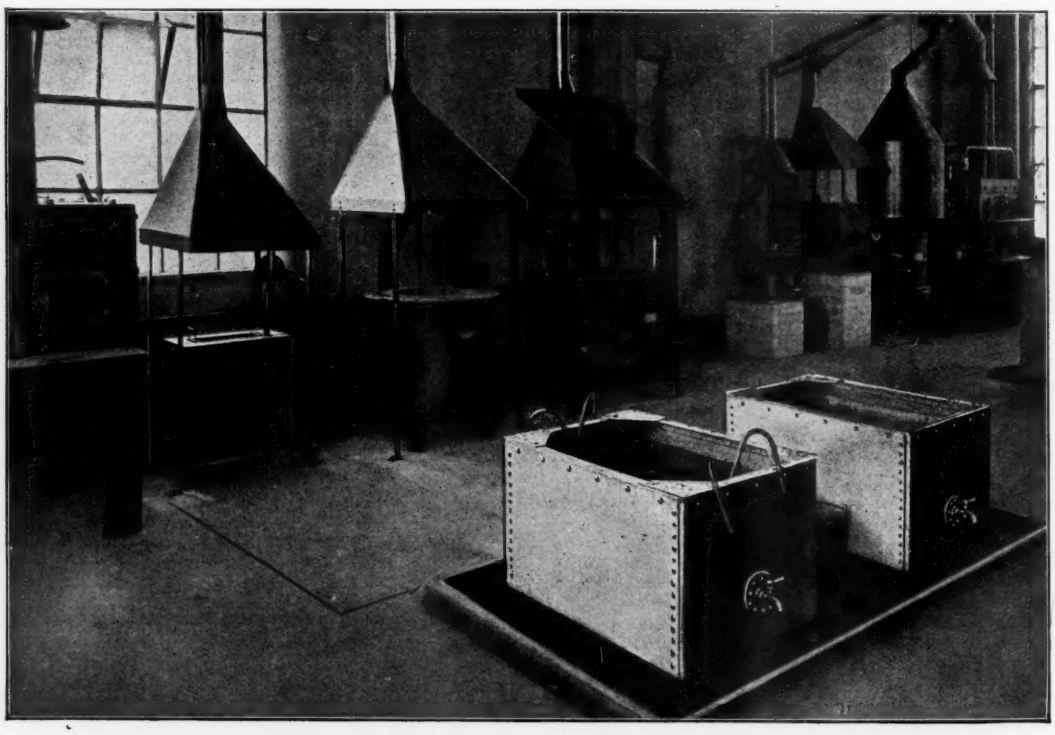


Fig. 12.—A Modern Hardening Shop in a Large Works, showing Eight Types of Furnaces.

made for, and used in, the hardening shop; but the examples I have shown are the ones for which there is the largest inquiry. Fig. 12 illustrates a modern hardening shop equipped with all the various furnaces just described. This is at the works of Messrs. Kayser, Ellison, and Co., Limited, of Sheffield.

Forging Bolt and Rivet Making.

Leaving now the steel trade with its wide ramifications, another industry of local interest is that of forging and bolt and rivet making. A gas and air-blast furnace for this work is illustrated by fig. 13. It is heated with gas at town pressure, and air at 1½ lbs. per square inch. By it, three 1-inch bars can be heated to a welding heat per minute, with a consumption of approximately

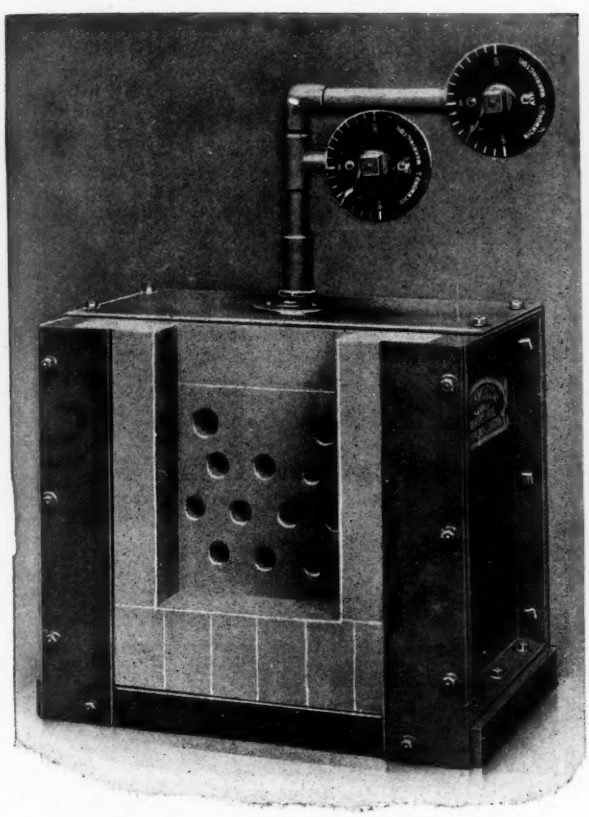


Fig. 13.—Richmond Gas and Air-Blast Furnace for Forging Bolts and Rivet Making.

250 cubic feet of gas per hour; or, on the Newcastle Gas Company's industrial tariff, 180 (1-inch) bars can be heated per hour at a cost of about 5d. A furnace to take the same number of bars of ¾-inch diameter consumes about 200 cubic feet per hour.

Brazing.

Among the numerous activities of this district, an important operation is brazing—*e.g.*, brazing flanges on copper pipes, &c.; and this work is at present largely done in coke hearths. Brazing may be achieved in gas-furnaces, with gas and air-blast fitted, much more satisfactorily, seeing that the joint can be set without any possibility of coke dust mixing. Further, this operation will be found to be more expeditious; and the possible small extra cost will be amply repaid by the advantages. A high-pressure gas brazing forge (one of a series) installed by a firm of gun and rifle makers whose name is familiar to sportsmen all over the world will completely braze gun barrels to the breech of a heavy sporting rifle in twenty minutes, which is a much shorter time than when solid fuel forges were in use. Brazing in the cycle industry (where gas is very freely used) is also well known.

Crucible Furnaces for Melting.

Passing now to the non-ferrous metal trades, it will be interesting to note the application of town gas for melting brass, aluminium, admiralty metal, and other alloys in crucible furnaces. The system prevalent in the Birmingham district is high-pressure gas, compressed to 12 lbs. per square inch. The practical results realized by manufacturers using furnaces supplied with high-pressure gas have proved successful. Taking all factors into consideration, not omitting the human element, admiralty metal can be melted with a consumption of 4 cubic feet of gas per pound of metal, and brass with a somewhat less consumption, on the high-pressure system; and the figure has been greatly reduced on laboratory and special tests. A test was recently carried out in a Richmond crucible furnace, worked with gas and air-blast, with pre-heating chambers over the crucible. The results were as follows:—

Capacity of crucible	60 lbs.
Time employed to heat to working temperature	25 minutes
(*a*) 60 lbs. of gun-metal scrap placed in hot furnace melted in	21 minutes
Gas consumption for melting	95 cub. ft.
(*b*) 60 lbs. of large awkward gun-metal scrap melted in	32 minutes
Gas consumption for melting	135 cub. ft.
(*c*) 60 lbs. of light brass scrap melted in	29 minutes
Gas consumption for melting	100 cub. ft.

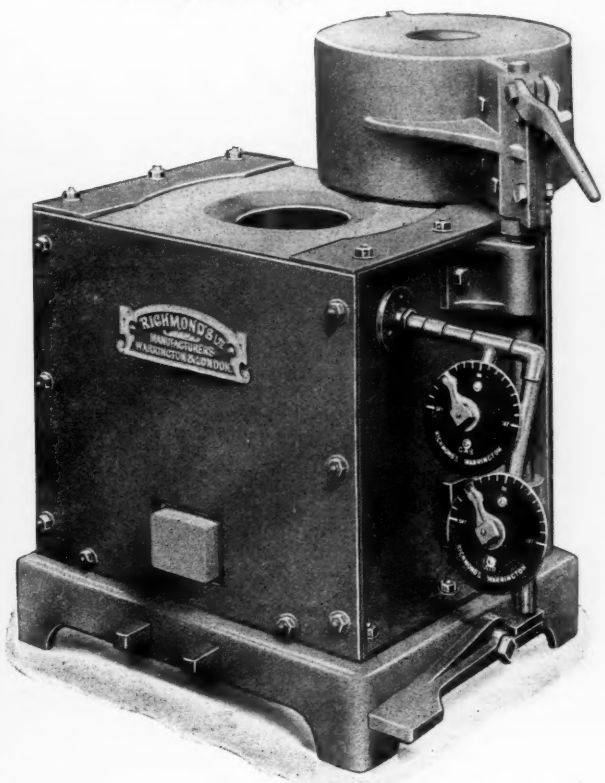


Fig. 14.—Richmond Gas and Air-Blast Crucible Furnace with Pre-Heating Chamber.

In foundry practice it would be found difficult to maintain such low consumptions; but a gas-furnace in the hands of a good caster may be used with the most efficient and economical results. I might mention in this connection that gas and air-blast, or high-pressure gas, used in properly-designed furnaces, will give equally good results. Fig. 14 illustrates the crucible furnace referred to.

Lead Melting.

Lead melting in pot furnaces, with low or high pressure gas, is now a good deal in use, especially in the printing and kindred trades. With high-pressure burners, the gas consumption works out to about 15 cubic feet per hundredweight of metal reduced to pouring point. With low-pressure gas in a melting-pot furnace of recent design, 4 cwt. of metal was treated in one hour, with a gas consumption of only 50 cubic feet. This was with a hot furnace after several melts of the same weight had been successively dealt with; and it shows how economical gas-furnaces are when the brickwork is thoroughly impregnated with heat.

Pyrometers.

Having now dealt with the leading types of gas-heated furnaces, this paper would be incomplete without a brief reference to the highly desirable addition of pyrometer or pyrometers to any installation.

Their value for the accurate measuring of temperatures is now so firmly established that it is not really necessary to urge upon manufacturers the advantages to be gained by their use. For gas-furnace work pyrometers may be divided into two main types—viz.:

(*a*) *The Thermo Electric Pyrometer.*—This pyrometer is useful for recording temperatures up to 1200° C. It consists of a poker in the form of porcelain in steel tubing, to which the thermo-couples are attached. This poker is placed in the furnace and connected by leads to the indicating or recording instruments, which may be of either a portable or permanent wall type character.

(*b*) *The Radiation Pyrometer.*—This instrument is suitable for measuring temperatures beyond 1200° C. As its name implies, it consists of an appliance placed outside the furnace and receives the heat radiations and indicates the temperature on the recording instrument, through leads.

The recording instruments automatically produce on suitable

charts a continuous record of the furnace temperature of either twenty-four hours, or, if necessary, seven days' duration. Such records are invaluable in the regulation of efficient running of gas-furnaces.

A Few of the Advantages of Gas-Furnaces.

In bringing this paper to a conclusion, I would briefly recapitulate some of the advantages of gas for industrial work, though many of these will be at once apparent to you:

(1) Economy in space occupied by appliance; necessity and expense, in some cases, of smoke-stack eliminated; a practically unlimited choice of position for the furnace, which enables it to be brought in close proximity to machine workers.
(2) The constant and unvarying supply of fuel of a uniform calorific value, at a fixed rate.
(3) No space required for storage of fuel, and no removal of ashes.
(4) Labour saving—absence of stoking, storage, and conveyance of fuel.
(5) Rapidity and improved production, due to ability to precisely control correct working temperatures.
(6) In many cases a lower capital expenditure of installation.
(7) Cleanliness, which frequently is of primary importance where furnaces have to be introduced into machine-shops, or in close proximity to machines.

Abatement of Smoke.

The last point leads me to refer finally to the national problem of the abatement of smoke. In this country, the manufacturer has had available a cheap hard fuel, comparatively speaking, only a few yards from his door; and he has not failed to use it in the crudest form. The Continent supplies the contrast. For many years there, fuel engineers have studied the utmost economy in the production of heat; and the consequence is that Continental towns are far more free from smoke, and enjoy a fuller share of pure air and sunshine, than industrial centres in England. It has been shown conclusively that the use of gas-cookers, gas-fires, and gas water-heaters for domestic purposes in our large cities and towns has been, in addition to their many other advantages, accompanied by a marked increase in the number of hours of sunshine enjoyed by the community per annum, and a decrease in the number of dirt-producing and unhealthy fogs. The introduction of gas-firing in substitution for hard fuel is the contribution—and it is not a small one—that the manufacturer can make to the solution of this great and urgent sanitary problem.

At the conclusion of the lecture,

Mr. J. A. Cowen, a Director of the Newcastle and Gateshead Gas Company, proposed a vote of thanks to Mr. Thornton for his instructive lecture. He need scarcely say that they, as representing gas companies, were only too anxious to do anything to further the use of gas in any form at all, not only from their own point of view of selling gas, but because they were thoroughly convinced there were many uses to which gas could be applied that were little known to the general public, and in many cases were not too well known to managers of works. Mr. Thornton's lecture had shown the great many uses to which gas could be applied, and also the various trades which were now employing gas. Some of the local industries were using gas for manufacturing purposes; and he fully believed its use could be greatly extended. Perhaps it was not generally known that the premier manufacturing firm in the Newcastle district—the Armstrong-Whitworth works at Elswick—were at present largely employing gas-furnaces, and were increasing the use of them. Gas-furnaces made for economy and efficiency of work. Definite and fixed heating could be obtained; and this was a matter of great importance to manufacturers.

The vote of thanks having been heartily accorded,

Mr. Thornton briefly replied. He said gas-furnaces made for efficiency of work generally, and showed manufacturers how to produce an article which could compete with their competitors abroad. Further, they all desired to see a purer atmosphere in manufacturing centres; and if they could bring this about by the use of gas, so much the better would it be for everybody. It would improve their physical condition and brighten their lives.

It is gratifying to know that Mr. Thornton's lecture, as noticed above, was a pronounced success. There was an excellent attendance, fully representative of the leading industries of the Tyneside district. The Newcastle Gas Company and other gas undertakings in the vicinity, who were all represented, were unanimous in their opinion that it would do a great deal of good.

Among those present were three Directors of the Newcastle Gas Company: Alderman Penman and Messrs. Cowen and Allis; Mr. Thomas Waddom, the Secretary of the Company; Mr. John Lewis, the Company's Distribution Engineer; Mr. Harold E. Bloor, of York; Mr. Norman S. Cox, of Sunderland; Mr. T. H. Duxbury, of South Shields; Mr. Herbert Lees, of Hexham; Mr. A. Mead, of Sheffield; Mr. C. J. Potter, the Chairman of the Walker and Wallsend Gas Company; and Mr. Fred J. West, of Manchester. Many of the large manufacturers of the district were represented—among others: The North Eastern Railway Company, Messrs. Armstrong, Whitworth, and Co., the North Eastern Marine Engineering Company, Messrs. C. A. Parsons and Co., and Messrs. W. Doxford and Sons.

At the conclusion of the lecture, tea was provided by the Gas Company, in which about two hundred gentlemen participated, and full advantage was taken of the demonstration of furnaces which had been arranged. Great interest was evinced by the visitors in the explanations given by members of the staff of the Company and that under Mr. Thornton's control.

Exhibition of Industrial Gas Appliances.

In a room in the building where the lecture was delivered various natural-draught oven furnaces were exhibited. They are made in various sizes from 2 feet square up to a length of 18 ft. by 3 ft. by 3 ft. The first furnace actually shown measured 27 in. by 18 in. by 9 in.; and it will heat up to 1350° C. without air blast. It is used up to temperatures from 700° to 1000° C. for hardening and annealing. A salt or lead bath furnace was inspected with interest. This is heated by four natural-draught burners. The pot which contains the lead or salt has a capacity of about 2 cwt. of lead. Whether lead or salt is used, they are heated up to a temperature of 750° C. This furnace is used for hardening all kinds of carbon or crucible steel, steel tools, steel components, &c. The next furnace shown was a gas air-blast crucible furnace containing a crucible of 60 lbs. capacity, suitable for melting Admiralty metal, gun metal, copper, or yellow brass. There was also a small furnace with air blast with preheating chamber, used for hardening steel noses of high-speed machine tools, planes, &c. Another air-blast furnace which attracted a good deal of attention was one suitable for heating ten rods at a time for bolt and rivet making. The rods are placed in the holes in the furnace front, and are heated to the required temperature and withdrawn in rotation. As a hot rod is drawn, a cold one replaces it.

MANCHESTER JUNIOR GAS ASSOCIATION.

Fourth University Lecture.

The fourth of the series of lectures arranged to be held in the Manchester University was given on Saturday in the Chemistry Theatre by Mr. J. W. Mellor, D.Sc., of Stoke-upon-Trent; the subject being "Refractory Material as Used in Gas-Works." There was a fair attendance of members of the Association, besides a number representing the Manchester District Institution.

The President (Mr. W. L. Heald, of Preston) and his officers extended a cordial welcome to the visitors, and requested Mr. T. Banbury Ball, of Rochdale, a Past-President of the Manchester District Institution of Gas Engineers, to take the chair.

Mr. Ball, who was received with applause, said he was present at the request of the President. He had much pleasure in introducing the lecturer, and felt sure the subject he would deal with would prove an interesting one. Dr. Mellor occupied a most important position at the head of the Staffordshire County Council Laboratories, and had unique experience in the handling of refractory material. Few subjects could be of more interest to those engaged in gas manufacture than the knowledge of the behaviour of these materials and their temperature. Alluding to the work of the Refractory Materials Committee of the Institution of Gas Engineers, Mr. Ball said they could hardly consider that very much had as yet been done, so they could not think their labours had been altogether satisfactory. From time to time they heard that the tests of materials which had been made, or said to have been made, according to their specifications had not yielded the results expected; so perhaps the lecturer would be able to throw some light upon the reason of these discrepancies.

Dr. Mellor then delivered his lecture, which, with some of the remarks upon it, will be found on p. 647.

At the conclusion of the lecture,

Mr. W. Buckley (Manchester) moved a vote of thanks to Dr. Mellor. He said he was quite sure that when the members had the time to carefully consider the lecture, it would prove a most valuable contribution to the "Transactions."

Mr. J. E. Christopher seconded the motion.

Replying to the unanimous vote of thanks, Dr. Mellor said he regretted that he had been unable to complete the lecture earlier; otherwise members could have had it beforehand for consideration. There was, however, no doubt that the whole question of refractory material in retorts required looking into very seriously, for the characteristics and individual properties of clays were most important.

On the motion of the President, a hearty vote of thanks was accorded to Mr. Ball for his chairmanship.

The London and Southern District Junior Association will next Saturday afternoon visit the works of the Commercial Gas Company at Stepney, to inspect the gas-furnace laboratory there. Various types of furnaces will be on view, and demonstrations will be given of melting and running cast-iron tilting-furnaces and glass bending. On Friday, the 27th inst., at Westminster Technical Institute, Mr. Frank J. Pearce (of the North Middlesex Gas Company) will read a paper entitled the "Reconstruction of a Retort-House."

SCOTTISH JUNIOR GAS ASSOCIATION.

WESTERN DISTRICT.

An Ordinary Meeting of the Scottish Junior Gas Association (Western District) was held in the Royal Technical College, Glasgow, last Saturday—Mr. JOHN WILSON, of Falkirk, the President of the Association, in the chair.

INVITATIONS FROM THE INSTITUTION OF GAS ENGINEERS.

The CHAIRMAN, at the outset, said that he had received two letters of importance during the course of the week. One was from Mr. Walter T. Dunn, the Secretary of the Institution of Gas Engineers, stating that it was the intention of the President and Council of that body to invite the President and Secretary of the Association to be present at the Institution meeting in Liverpool in June. He thought it was exceedingly nice that the Senior body should recognize the Juniors in this way. The other letter was from the President of the Institution of Gas Engineers, Mr. Edward Allen, stating his regret that the Scottish section of the Juniors had not been invited to nominate a member who would give a paper at their June meeting. This had occurred through an oversight. He now gave the invitation somewhat belated, but trusted the Association would still be in a position to nominate someone. He (Mr. Wilson) was glad to be able to inform the meeting that they had got a gentleman who had come forward to offer his services in this respect. So they would have one member at least whose paper would be put before the Adjudication Committee, who would meet on the 19th inst. The individual whom the Adjudication Committee decided upon would read his paper to the Institution. He hoped that their Association would contain the lucky individual.

Mr. THOMAS MOFFAT, of the Tradeston Gas-Works, then read the following paper, on the

REPAIR AND MAINTENANCE OF GAS-WORKS PLANT.

These notes on the repair of gas-works plant will include the methods adopted of clearing-out deposits in mains, &c., throughout the works, in the hope that it will create a good discussion, and thereby bring out the ways and means adopted by those of us who have this particular class of work to do. Now that vertical retorts are being installed in most gas-works where new plant is required, and as stoking machinery may be relegated as a thing of the past, I have purposely left such plant out, but coal breaking machinery will still be required; so I have taken this first.

REPAIRS TO COAL-BREAKERS.

Coal-breakers as a rule are constructed on generous lines, and it will seldom be found that the breaker itself, with the exception of the bearings, will require much attention. The bearings and the engine in nine cases out of ten will be found to give all the trouble. The breaker bearings are usually of cast iron or gun metal. Now cast iron makes a good bearing if well lubricated; but, should the oiling be neglected, it will wear rapidly, and not only soon be useless, but will have the tendency to destroy the shaft or at least to cause it to wear unduly. The same applies to gun metal—only the shaft does not stand the same chance of being spoiled. Manufacturers often make the mistake of having the shaft all one diameter. Now this should not be done; for, if the shaft shows signs of wear as it is bound to do, it is impossible to make a satisfactory job of the bearing when it is a solid bush. Of course, if it should have split bearings, it does not much matter; but as a rule it is solid bearings or dead eyes that are fitted. Having been troubled by this at Tradeston, we have had to get sleeves fixed of a larger diameter than the shaft to allow for the wear that takes place, and to let us renew them without having to go to the expense of new rollers.

All this points to efficient lubrication; and how is this arrived at when in almost all cases these breakers are in the hands of unskilled workers? Our plan of overcoming the difficulty is the adoption of a mechanical oiler—such as the M'Cord, the Manzell, or other good mechanical lubricator—which takes the work out of the attendants' hands, with the exception of filling the oiler. Once the feed is regulated, it requires no more attention. Having fitted up one of these lubricators and examined the bearings after a year's work, everything was found to be in good order. The breaker is now working again, and should run for another season at least without requiring repairs; so that, although the fitting of one of these lubricators may be a little more expensive at first, it soon pays itself, as there is a saving in the amount of oil used, and also the life of the bearings is lengthened.

Now let us examine the engine. These engines are usually of the horizontal or mill type, and are coupled-up to the breaker by means of steel gearing. They have to withstand the great amount of strain that is thrown upon them by the inrush of coal into the breaker, with the result that the engine is pulled up sharply; and unless the man in charge is careful in the feeding, fracture is bound to occur sooner or later. This has actually happened; for the forward bearing has given way at this point. A temporary repair can almost always be made by drilling and tapping a hole down the centre of the broken part and inserting a stud as large as possible, then replacing the broken part and fixing a stiffener on the back. This makes a good temporary repair; and if it is looked after and the stiffener kept tight, it will outlast the season. After that the engine should be taken out and repaired properly. There are two or more ways of doing this. The first is the well-known method of having a piece burned on at the foundry, and the other that of having the broken piece brazed on by the newer process of cast-iron brazing. Having tried both ways, I am greatly in favour of the latter process, as it makes a neat, clean, and sound repair, and requires very little to be done to it afterwards. The opposite is the case with the burning-on process, as there is usually two or three days' work for a mechanic to get it back to its original shape.

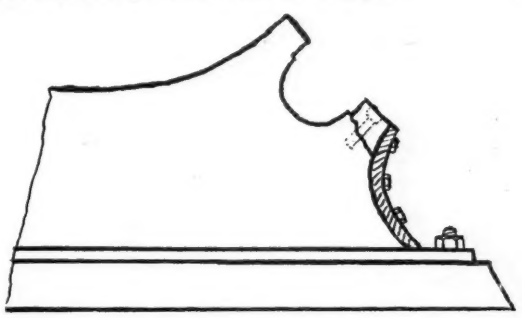
REPAIRING THE FOUL MAIN LEADING TO THE CONDENSERS.

These mains are lap-welded steel tubes, 24 inches in diameter by $\frac{5}{16}$ in. thick. They come through the retort-house wall at a height of 20 feet, cross the yard, and drop down into the inlet main of the condensers. Some years ago the lower end of one of these downcoming tubes showed signs of wasting at the faucet, where it enters the condensers. The wasting was taking place from the outside, due probably to the jointing material used, which was sal ammoniac and iron rust. This, of course, had to be remedied, and the manner in which it was done was as follows: Two pieces of angle iron (the same section as the T-piece) were bent round a pipe of the same diameter, and welded where their ends met. Then a piece of mild steel plate, 8 in. by $\frac{1}{4}$ in., was also bent to the same diameter, and riveted to the angle-iron rings—this then forming a distance-piece. The main was next propped up, and the joint broken at the T-piece, the pipe lowered by means of shears and tackle, 8 inches cut off the bottom, the distance-piece connected, and then hoisted back into its place again and the joint made. This entailed a good deal of time and labour, and, needless to say, the gas had to be off at the time.

The method by which the second one was repaired was as follows: An angle-iron ring was made in halves and placed round the pipe resting on the faucet, and six holes were drilled at regular intervals round the ring. These holes in the ring were clearance holes, and the holes in the pipe to correspond were tapping holes. Jointing material was then placed round the faucet, and the angles drawn into position by means of set-screws. As a finishing off, ferrous compound was pressed into the angle ring and left to set; and in a few hours it was as hard as the metal round it. This made a good and lasting repair, and all the work was carried on while the pipe was in use.

REPAIR TO THE GAS EXHAUSTER.

The exhauster in question is one of the Beale type, with double blade passing through the slotted shaft and drum. On the sides of the blades at the outer ends are guide-pieces which travel in a groove in the cover, keeping the blade in position, and reducing the strain on the shaft. These guide-pieces are held on by two $\frac{3}{4}$-inch bolts and double nuts, and one of these nuts had worked off and was carried round with the blade until it rested half in and out of the inlet port. The blade coming round caught the nut and carried it round, wedging it firmly between the blade and the cylinder wall at the bottom; the result being that the blade forced the nut through the cylinder, causing a fracture, 11 in. by 10 in., and also cracking the flange. Fortunately the man who was in attendance happened to be beside the engine at the time, so a bad accident was avoided, as the engine only stopped momentarily and then went on again, and at the time the exhauster was drawing nearly 60,000 cubic feet per hour. Of course, the man stopped the engine and shut the valves as quickly as possible, but not before the place was well filled with gas.



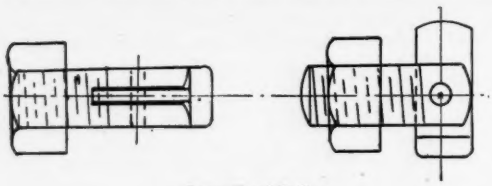
Coal-Breaker Engine Repair.

On examining the exhauster it was thought its usefulness was done, and that, being of the older type (having been built in 1887), difficulty would be met in getting a new cylinder. So we drilled holes along the outside of the cracks and removed the fractured pieces. The flange also being cracked, it had sprung out fully $\frac{1}{8}$-inch on the one side. We placed a gland across the crack, and drew the flange back to its original position, and to keep it there we drilled and tapped a hole through the centre of the crack and screwed in a stud, then removed the gland, and cut off the stud flush with the face of the cylinder flange. This allowed us to make a pattern for a casting. The pattern was made to fit tight into the place where the pieces were removed, and also to overlap the hole fully 5 inches all round. A piece was next screwed on to the face of the pattern to form an extra flange to stiffen the broken one. After being cast at the foundry, it was fitted and jointed, and drawn into position by means of set-screws. The casting was then scribed to the radius of the cylinder, removed and machined to line, and then replaced. It is now nearly three

years since the exhauster was repaired, and it is working as well as ever it did.

Repair to the Gasholder.

The holder is one of fully 4½ million cubic feet capacity, and, on its outer lift, one of the plates had been a laminated one. A section about 4 inches square began to peel off; so we found it necessary to repair it at once. Bolts had to be made, as it would have been useless to try and tap holes in so thin a plate; and, as T-headed bolts would have been very unsuitable, we had to devise some other type. So, taking a piece of ½-inch stud iron, a slot was cut down the centre, then another piece of iron of the same diameter was taken and filed down to fit the slotted piece,



Drop-Head Bolt.

and a hole was drilled through the two and a rivet inserted. This then formed a drop-headed bolt. Holes were drilled in the holder and plugged with pieces of wood, and cut flush with the holder plate. A piece of steel plate, having holes to correspond with those already drilled in the holder, was then covered with vulcan cement and placed in position, the plugs pushed inside the holder one at a time and bolts inserted in their place, then all screwed up tight. This made a very satisfactory repair.

Repairing a Purifying Machine.

There are four vertical rods passing through the top of the machine. These rods are fully 20 feet long and 2¾ inches in diameter; and to them are fixed the frames for carrying the wooden devices. A considerable amount of wear is taking place on each of these rods, just at the part where it works through the stuffing-box and gland. The stroke is 12 inches; and there are from six to eight strokes per minute of each rod. To renew these shafts would mean a great amount of trouble and expense; so to obviate this, all that will be done is to place sleeves over the worn parts. Short lengths of weldless steel tubes, having an internal diameter sufficiently large to pass over the screwed end of these rods, have been obtained. When the machine can be put out of action, the cross-heads, stuffing-boxes, and glands will be removed, and the sleeves fitted and fixed by set-screws. The stuffing-boxes and glands will be bored out to the increased diameter and replaced; and I have no doubt that this arrangement will make the machine as efficient as formerly.

Clearing-out Deposit in Works Mains.

Situated as we are at Tradeston, with the Caledonian Railway dividing our works—the retort-houses, scrubbers, &c., on the one side, with the purifiers, meters, and holders on the other—any deposit becomes a serious question, as our chief main, which is 24 inches diameter, is laid with very little fall over a footbridge. If the deposits were allowed to gather and form banks as they are inclined to do, a sudden break-away of one of these banks would be, to say the least of it, rather awkward. Along the whole length of main, plug holes have been drilled to allow of dipping, to find out how much deposit there is. Lengths of chain have been laid along the main from the outlet of the scrubbers to the inlet of the purifiers. To get these chains throughout the main, and to allow us to insert suitable tools, openings were cut in the top of the main. Of course, when the main is one straight length with suitable blind flanges at either end, it is quite a simple matter to lead a chain through. As often as not, cleaning doors have to be provided. The method of forming these openings while the main is in use is to mark on the main the size of hole required, then, with the aid of boring tackle, to start and drill holes as close together as possible inside the line as scribed—having wooden plugs handy, so that, when a hole is drilled, it can at once be plugged.

After all the holes inside the line are drilled, other holes will have to be drilled and tapped to take set-screws to fix the cover plate in position. This plate is usually made of ⅜-inch mild steel, bent to the curve of the main. When the gas is off the main, all metal between the holes can be cut away, and the piece removed. Next take as great lengths of 1½-inch by ¼-inch iron as possible, and bore two holes at each end, joining each length with two ½-inch bolts and nuts. Take the first length and turn up the end of it so that, when pushing these rods through the main, they will slide over the faucets and not be inclined to stick at them. On the end of the last length of rod attach the chain by means of a shackle, then pull out the length of rod from the further cleaning door until the chain comes through. Now, having got the chains through the main, take a shackle and attach to it as much canvas, or a bag filled with shavings, as will go through the door. To the shackle attach another chain, then start to pull the canvas or bag through the main, allowing the chain that was fixed last to the shackle to follow. Having pulled the canvas or bag through, and either pumped or baled out the deposit, take off the canvas or bag, and pull back the chain with the one that was following, and leave it in for future use.

So far it is only the bottom of the pipe that has been cleaned. Often this is all that you will manage, as through a cleaning door it is almost impossible to pass any suitable form of disc that will clean the whole interior of the pipe, except when two blind flanges are at each end of the main. A disc which we have found to suit the purpose very well consists of two pieces of wood, 2 inches smaller in diameter than the main; and nailed on the back of the discs is a piece of thick leather, the full diameter of the main. These two discs are kept apart by means of stay bolts slightly longer than the diameter of the main, so that they will not turn or jam in the pipe. Eye bolts are attached at the centre of each end of the disc, and the chain is attached and pulled through as in the former manner.

For short lengths of main, or where there are several cleaning doors, a claut is very handy, and if properly made suits the purpose well. The claut in use is made of steel plate having a piece of hoop-iron fixed to the centre, and turned up at the front and back to prevent it dropping into any spaces there might be at the faucet joints. To clean out a long length of main requires much time, and to do the whole main at one operation would mean the best part of a day with a fairly large squad. With the limited time at our disposal, only a section is done at a time, and only that showing the greatest pressure on the gauges which have been fixed at regular intervals throughout the main.

Naphthalene in Gasholder Inlets.

It is only within the last five or six years that naphthalene has been present to any extent in the inlet pipes of the gasholders at Tradeston. The pipes are 30 inches diameter, and the method adopted to clear them was to fix through the top cover a 1-inch malleable-iron tube extending to the bottom of the pipe below the level of the bottom of the tank, having a ⅜-inch hole drilled in one side at a distance of 12 inches from the bottom end. The top end of this tube is closed with a screw cap. If, on taking off the cap occasionally, the gas blows, it is an indication that there is not much deposit in the pipe. But if it does not blow, it points to a gathering taking place—either of water or naphthalene. If it is water, the pump will lift it; if naphthalene, of course it will not, unless it is dissolved. Our method of doing this is to connect steam to the 1-inch pipe already mentioned, and through another opening in the cover fix on a syphon and pour in benzol. The steam rising from the bottom meets the benzol, vaporizing and dissolving the naphthalene, which can then be pumped out. Pumping should not be stopped until the naphthalene is all out. Afterwards several pails of cold water are poured in, leaving only sufficient to seal the pump. Pressure gauges are fixed on both the inlet and outlet pipes; and from these it is noticeable whether the pressure is more than normal.

DISCUSSION.

Mr. Thomas Carmichael (Dalmarnock), the Vice-President of the Association, opened the discussion. He considered the paper had been of a most interesting and practical nature. Mr. Moffat had gone so fully into the details of the repairs, and had given so much information, that there was really little left to say. Referring to the exhauster, however, the author said that the old Beale exhauster had slots cut in the drum through which the plates passed, and these plates had steel-cased pins which worked on wrought-iron segments and turned round in grooves in the cover of the cylinder. He wished to know if the steel pins were bolted on to the end of the plates, or was it segments? Regarding the nut which was lying in the inlet part of the exhauster, he could not see how this could possibly get round to the bottom without first of all having to travel right round the top of the exhauster. He was much interested in the details regarding the purifying machine. He thought it a very good wrinkle for makers to take up.

Mr. James M'Nicol (Dawsholm) having referred to the exhauster, remarked that the most important point nowadays bearing on the satisfactory working was that of lubrication. Had Mr. Moffat had any trouble with dust accumulating in the lubricating machines? Could they take out the bottom rollers of the coal-breaker without first of all removing the top ones?

Mr. David Fulton (Helensburgh) said there might be nothing very novel in the paper to engineers of twenty years' standing; but to juniors there were many good hints that it would be well to take to heart. One of the most interesting points was the putting of the patch on the holder. He was sure it must have surprised many visitors to Tradeston. While Mr. Moffat's method of clearing away naphthalene was successful in Tradeston, that did not mean to say that it would be successful in other places. What cured in one place might not cure in another.

Mr. Wright (Lockerbie) said that before he went to Lockerbie somebody had been cleaning the gas-engine, and instead of putting the piston rings in the proper places, they started to drive the piston in with a sledgehammer, and thus burst the piston case.

Mr. M'Ghee (Glasgow) remarked that in the early part of his paper the author made a somewhat bold statement. He had practically indicated that the day of stoking machinery was over. He was afraid there was not a consensus of opinion regarding this. They had noticed the other day that one of the great London works had installed horizontals, with a large equipment of stoking machinery. As to the author's way of overcoming wear and tear on the scrubber shafts, he considered it a good idea; and, as had been suggested, it might be adopted by the makers. There was, however, this much against it—that it did away with the makers being called in to fit new shafts.

Mr. MacLaren (Dumbarton) looked upon the paper as illustrating that such repair work required a considerable amount of

ingenuity. Very often a man was placed in contact with that necessity which was the "mother of invention," and it was good for developing his resources and initiative.

Mr. PURVES (Auchengeich) expressed surprise at the elaborate provision made for cleaning out stoppages in the mains. As it was almost a daily occurrence with them, they thought nothing about it. Their method was to bale it out in various sections. With regard to repairs to the crusher, he noticed that Mr. Moffat said that the bulk of the repairs were to the engine and shafting; whereas they found that if anything more than a 2-inch tube went into the breakers it meant a smash up.

Mr. SMITH (Tradeston) held that ordinary repairs formed a considerable item in the expenditure on a gas-works. It came down to this, that a great deal depended upon the class of material supplied. He thought directors and committees had a good deal to answer for in this respect. The ordinary way of making contracts—advertising for materials and buying from the cheapest offerer—was not always the best. More attention was needed with regard to material in the settling of contracts.

The CHAIRMAN, in closing the discussion, said he thought those who had listened to the paper would agree that one of the essential things in a gas-works, as in any works, was constant supervision. If they had a daily inspection of all moving parts of machinery, they would find their repair bill dropping down by 75 per cent. Efficient lubrication was the thing to be looked for. When they had a man with an oil-can going about now and again he deluged the bearings with oil and then left. Coal dust added its little quota to the mixture, and so the thing went on. As Mr. Moffat said, one of these automatic lubricators went a long way towards reducing repair costs. With regard to repairs themselves, they all wanted to hear about extraordinary repairs. They all knew more or less about ordinary repairs. It was when they met extraordinary repairs that they had to exert their ingenuity.

Mr. MOFFAT, in replying, dealt generally with several of the points raised by drawing explanatory diagrams on the blackboard. Dealing with Mr. Carmichael's remarks, he sketched the old Beale exhauster, indicating the attachments referred to, and showing where the nut came off the bolt which did the damage. He agreed with Mr. Carmichael that the nut had really been lying in the outlet and not in the inlet, as had been stated in his paper. Mr. M'Nicol had asked if they could take out the bottom rollers of the coal-breaker without first removing the top ones. The answer was in the negative. The exhausters did not permit of this being done. They had to take off the top rollers before withdrawing the bottom ones. It was a bad design, and could be improved on in later systems. Dealing with brazing processes, he referred to the difficulty of getting an even temperature on the work under treatment. The cooling was not equal, and this was the chief drawback.

A hearty vote of thanks to the author concluded the meeting.

RETORT-SETTING FOR CONTINUOUS WORKING.

The Stettiner Chamotte Fabrik Actiengesellschaft (vormals Didier) have taken out a French patent [No. 461,685 of 1913] for a generator retort-setting which can be kept working continuously notwithstanding the fluctuations in the consumption of gas which take place at different periods of the year; thereby, it is claimed, ensuring not only a profitable return on the capital invested in the setting, but a constant production of coke.

The following illustrations show two different methods of constructing the setting. Fig. 1 is a longitudinal section on the line 1 of fig. 2, which is a transverse section on the line 2 of fig. 1. Fig. 3 is a longitudinal section of a portion of a setting with a variant in the device for conveying gas into the heating chamber on the line 3 of fig. 4, which is a transverse section on the line 4 of fig. 3.

The setting represented in figs. 1 and 2 has horizontal retorts A supported by intervening walls B. Under the retorts is a generator provided with a stepped grating, the fireplace of which is connected with the combustion chamber C, surrounding the retorts, and, at certain periods, supplies it with heating gas. The generator is filled with fuel through the opening D, and the clinker and ash are removed at E. The air for combustion flows to the chamber C from the channels F, which are in communication with the passages G of the recuperators placed on each side of the generator. The walls B are so made that the combustion gases will ascend in the direction of the arrows between the middle and side groups of retorts. The discharged gases flow through the passages H of the recuperators, and effect a preliminary heating of the air of combustion in the passages G. In the higher part of the side walls of the generator there are special horizontal gas intake passages I connected with the passages for the admission of illuminating gas J. The latter passages, which can be closed by valves, are used to convey into the setting part of the gas produced. The passages I communicate with the chamber C through the openings K, which are regulated by dampers L, movable by suitable tools.

When there is a great demand for lighting gas, the generator is utilized to feed the setting with heating gas. In this case the valves and the dampers are shut, and all the lighting gas is conveyed into the distribution plant. In the summer time, however, when the consumption falls off, the generator is thrown out of action. For this purpose the openings D E for filling and cleaning the generator (shown by the broken hatching in figs. 1 and 3) are walled-up to keep out the air. The valves of the passages J are open, and the dampers L regulated as required. The setting in then worked in such a way that from 50 to 60 per cent. of the lighting gas is conveyed into the chamber C, so as to burn with the air arriving through the passages F, and serve to heat the retorts. Consequently the setting need not be stopped, and the production of coke is not interrupted. When the consumption increases again, the passages I are thrown out of action, and after the removal of the masonry the generator is utilized to furnish heating gas to the setting.

The form of construction shown in figs. 1 and 2 is preferable for new plant. When the variant previously referred to is to be applied to existing settings, it is advantageous to employ the type of structure represented in figs. 3 and 4. If in summer a portion of the lighting gas must be employed to heat the retorts, the fireplace of the generator is arched-over at the top with stones M, supporting refractory bricks N, in which a horizontal gas intake passage O is formed. This passage communicates with another, through which some of the lighting gas can be conveyed into it. There are in the refractory bricks oblique passages Q, branched on to the passage O, and terminating in the combustion chamber. The passages Q can be regulated with dampers. The openings for filling and cleaning the generator are again walled-up, so as to be impermeable to air. Thus a portion of the lighting gas can be conveyed through the passages O, P, Q into the combustion chamber, to be there utilized for heating the retorts. When the demand for lighting gas increases, the bridge M is taken down, and the bricks N are removed, as well as the masonry closing the openings D and E. Then the generator is started to convey the necessary heating gas to the combustion chamber, so that all the lighting gas can be made available for the consumers.

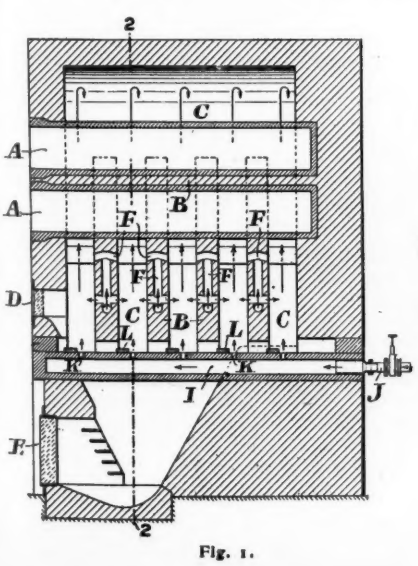


Fig. 1.

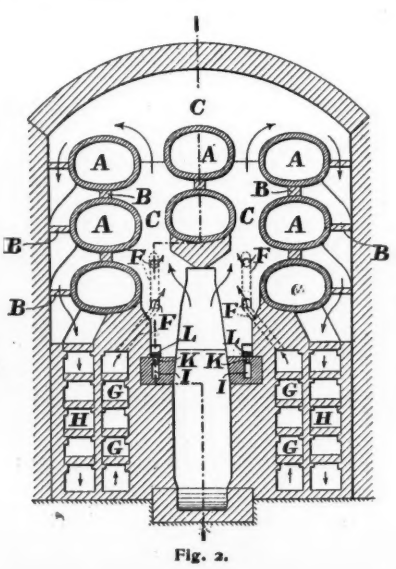


Fig. 2.

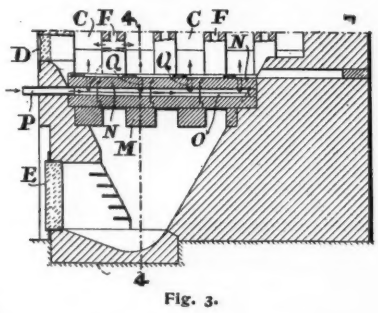


Fig. 3.

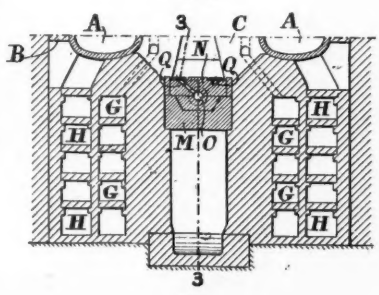


Fig. 4.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Midland Association Meeting.

SIR,—In your notice of my few remarks at the Midland Association meeting on the 26th ult., you reported my answers to Mr. Duff so correctly that they call for some little explanation.

I looked upon Mr. Duff's remarks as "chaff," and did not take them quite seriously, and did not dream they would be published. I will not attempt to say what these answers meant, but withdraw them entirely with your permission, and offer the following comment.

When coal is carbonized at the pit's mouth, as undoubtedly it will be, gas companies will still distribute gas in their districts, and make their profits; so that I do not think this will affect the shareholders' dividends, unless to increase them. Doubtless some gas engineers will be in charge of pit gas-works, and others will take up distribution and so on. But all these changes come about so gradually that there is no necessity to worry about such things. In my view, the gas industry of the future will be of immensely greater public service than even it is to-day; and the position of engineers and all connected with gas-works will be improved accordingly.

Generally and broadly speaking, I cannot dissociate our own personal interests from those of our shareholders and our customers.

GEO. HELPS.

Nuneaton, March 4, 1914.

Steam Raised by Gas Coke.

SIR,—Our attention is called to Mr. Seabrook's letter of the 19th of February, and also to your editorial comments.

There is an installation of thirty-two travelling grate stokers under water-tube boilers at the works of the Compagnie du Gaz de Lyon, France. The stokers were installed there primarily for burning coke-breeze. So far as we know there has been no trouble with the tubes, although the machines have been at work some two or three years.

UNDERFEED STOKER COMPANY, LIMITED.

South Place, E.C., March 6, 1914.

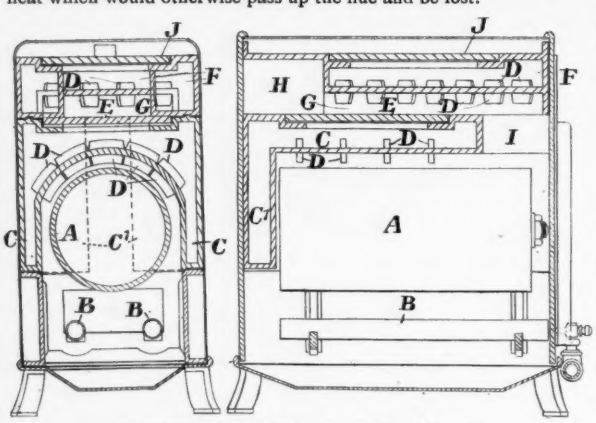
REGISTER OF PATENTS.

Gas-Heated Hot-Water Circulators.

STIMSON, E. F., of Upper Tooting, S.W.

No. 28,494; Dec. 10, 1912.

This gas-heated hot-water circulator is of the type in which the products of combustion, after having passed around and heated the usual water chamber or boiler, circulate around a casing arranged astride the boiler, through which the feed water passes prior to reaching the usual water chamber or boiler, so that it may absorb "a maximum of heat which would otherwise pass up the flue and be lost."



Stimson's Gas-Heated Hot-Water Circulator.

A cross-sectional elevation of the circulator is given; also a longitudinal sectional elevation.

The circulator is of the type in which one or more water chambers or boilers A (preferably constructed in accordance with Patent No. 29,011 of 1911 and No. 52 of 1912) are enclosed within a casing, and have burners B arranged beneath them. Instead of providing a merely insulating casing in conjunction with these boilers, the casing is made in the form of a hollow chamber C (with end walls C¹), the internal surface of which corresponds more or less to the contour of the boiler. Through the chamber C the water circulates prior to passing to A. The internal walls of C and the walls adjacent to the chamber A are formed with lugs D "designed to facilitate the collection and radiation of heat," while the chamber C is provided with an inspection and cleaning cover E.

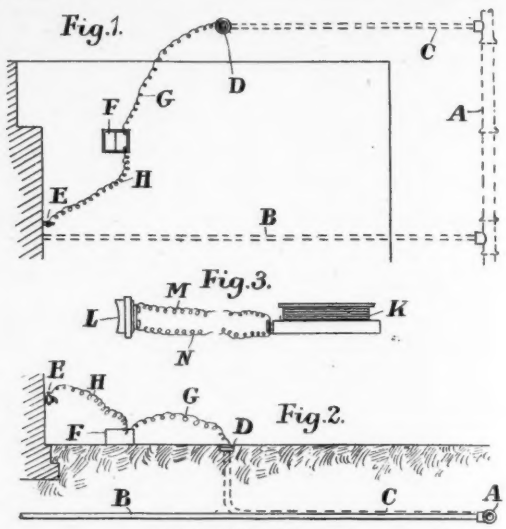
As an optional arrangement, a second feed-water chamber F is fitted over that described, in the form of a cover; a space G being formed between the two chambers, creating a flue through which the products of combustion pass prior to reaching the main flue by way of the outlet H. An opening I is formed in the chamber C to allow the products of combustion to pass to the flue. This second feed-water chamber is also provided with an inspection cover J more or less coinciding with that of the lower chamber.

Locating Pipes, &c.

MANSFIELD, E. A., of New Brighton, Cheshire.

No. 3181; Feb. 7, 1913.

In order to locate gas, water, or other pipes—lines capable of conveying electrical current but not normally employed therefor—the patentee proposes "to make use of portable means for providing an interrupted electrical current in such wise as to obtain a vibratory effect, which current is produced by an induction coil with condenser and contact-breaker, in conjunction with a battery or other portable source of electrical energy." In order to locate the pipe, the receiver and portable coil (the exploring coil) are carried about by the investigator; the former being employed receptively, while the latter is directed towards the ground or wall wherein the pipe is embedded, "the location being thus established by the strength or quality of the tone or effect."



Mansfield's Pipe Locator.

The diagrams represent an adaptation of the invention to the locating of a water pipe beneath (say) a house garden. Fig. 1 is a plan, and fig. 2 a sectional elevation of an installation of electrically conductive water piping, with connections for the purpose of the present invention. Fig. 3 shows the receiver and exploring coil.

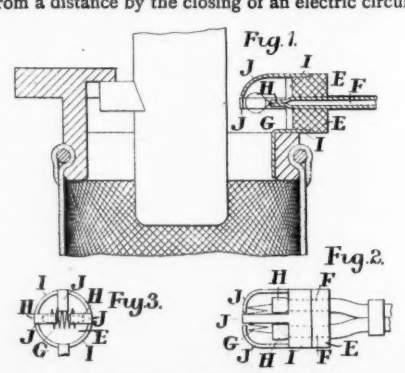
A is the main pipe; B a service branch to the house; and C a branch to a hydrant D. E is a connection with the house supply pipe. F is a casing containing a battery and induction coil or interrupter, and G H are wires connecting the terminals of the "energizer" with the points D E respectively. Thus a circuit is effected through the piping A B C. The "exploring coil" K and receiver L, forming with the wires M N a separate circuit, are carried by the investigator, who, with the receiver at his ear, and the exploring coil held towards the ground, takes a position near the connection E, and, by marking the variation in tone or effect by movement to and fro, will be able to locate a portion of the hidden pipe B, after which the direction of the pipe may be followed and indicated. In similar manner pipes in walls or under floorings may be located.

Igniting Gas-Burners.

OSTROROG, (Count) S. J., of Chelsea, S.W.

No. 9217; April 19, 1913.

This igniter for gas-burners is more especially intended for use in connection with a valve for turning the gas on and off, arranged to be operated from a distance by the closing of an electric circuit.



Count Ostrorog's Gas-Burner Igniter.

Fig. 1 is a vertical section of the upper portion of an incandescent mantle resting upon the lower portion of an inverted burner, and having one form of the igniter applied thereto. Figs. 2 and 3 are a plan and an end view of the igniter.

The igniter shown on the right-hand side of fig. 1 consists of an insulating block or head E having recesses into which tubes F are tightly fixed. The projecting ends of the tubes at one end of the insulating

block receive the ends of a platinum coil G retained in position by crushing the tubes in as shown at H. This prevents endwise movement of the tubes in one direction; and movement in the opposite direction may be prevented by slightly compressing or distorting the tubes on the opposite end of the block or head. At the opposite end of the block the tubes are connected to terminals for conveying electric current.

The most satisfactory position for the igniter is said to be just above the mantle ring or frame. In order to protect the coil from injury, a metal guard or shield is provided, consisting of a band I made to closely surround the block, and furnished with projecting bars or blades J, so bent as to surround the coil. The bent or curved blades not only serve to protect the coil from injury, but they also catch and direct the gas on to the coil. The lowermost bar or blade is bent downwards, as shown in figs. 1 and 2, so as to form a lug or extension adapted to retain the igniter in the required position.

On gas being admitted to the burner nozzle and mantle by means of a valve electrically actuated or otherwise, and the coil G being rendered incandescent by the passage through it of an electric current, the gas escaping between the mantle ring and the burner nozzle passes across the incandescent coil and is ignited.

Manufacture of Ammonia and Other Bye-Products in Gas-Producers.

WADE, H.; a communication from "Montania" Brennstoffverwertung G.m.b.H., of Berlin-Charlottenburg.

No. 9499; April 22, 1913.

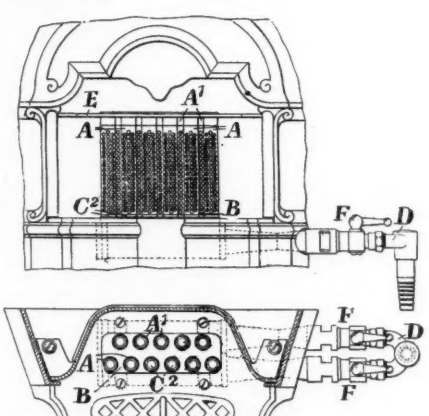
This invention is more particularly applicable to the distillation of wood, peat, brown coal, olive husks, seeds, and seed husks—for instance, for obtaining from wood acetate of lime, methyl-alcohol, and tar; from peat, acetate of lime, methyl-alcohol, ammonia, and tar; from brown coal, tar and ammonia; from olive husks, acetate of lime, methyl-alcohol, ammonia, and tar; and from seeds (cotton and sun-flowers) acetate of lime, methyl-alcohol, and oil. It is proposed to treat separately the gases of the different zones in multiple-zone producers in which the zones are separated by the fire, for the purpose of obtaining the bye-products. This, it is said, has the advantage that the contents of ammonia and other bye-products in the gases of the first zone are not lost, and further that only these gases, and not the whole gas mixture, as in the case of single-zone producers, need be treated for separating tar.

Gas Stoves or Radiators.

JOHN HARPER AND CO., LIMITED, and RETALLACK, C., of Willenhall.

No. 9717; April 25, 1913.

This invention relates to open-fronted gas stoves or radiators in which the heating effect is produced by the combustion of the gas within refractory tubes.



Harper and Retallack's Gas Heating-Stove.

A practical application is shown of the invention in the case of a stove provided with two straight rows of tubes, one behind the other.

The general construction is of the usual character. The refractory tubes A, having a number of small perforations, are the front row of tubes within which combustion takes place; and the corresponding tubes A^1 are the back row, placed opposite the spaces B of the front row of tubes. The arrangement of the tubes in two rows, instead of in a single row, is said to reduce the width of the stove for the number of tubes used. Each row of tubes is supplied with mixed air and gas from a separate mixture pipe C or C^1, through nozzles which enter the lower ends of the perforated burner tubes. The pipes are formed together side by side in one casting, and are supplied with mixed air and gas through pipes which extend from a breeches pipe D. The gas and air are controlled by means of a device F between the extension pipe and the corresponding leg of the breeches pipe. The upper ends of the tubes A A^1 are steadied in a plate E.

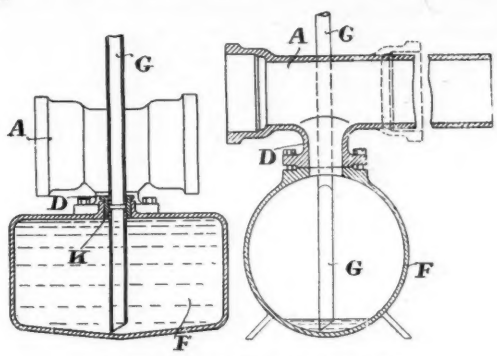
The arrangement of the burner tubes shown is said to secure a "much intenser heat being given out per unit of area at the front of the complete set of burner tubes, and a much brighter appearance than when the burner tubes are arranged in a single row."

Water-Traps for Gas-Mains.

BILLAND, C., of Kaiserslautern, Germany.

No. 20,487; Sept. 10, 1913.

One object of this invention is "to enable the use of ordinary three-armed junction pieces, which are always kept in stock by large gas-works, and which comprise two sockets in allignment with each other for the reception of the gas-main and a flanged branch at right angles to the sockets." For this purpose, the water-trap, which comprises the ordinary wide vessel having a small inlet opening, is connected directly to the flange of the junction piece by bolts passing through the top of the water-trap and through the flange of the junction piece. The water-trap, being thus detachable, may be readily exchanged or replaced by a larger one, when required, without any change in the gas-main itself. The junction piece can also be exchanged or replaced by a junction piece of other dimensions to adapt it to larger or smaller gas-mains.



Billand's Water Traps for Gas-Mains.

Two forms of the invention are shown. In the first, A is the usua junction piece which is adapted to be inserted in the gas-main and having a flanged branch D to which the water-trap F is firmly connected by bolts (the water-trap in this case having the usual form of a flat cylindrical vessel). A suction pipe G is carried up, as usual, from the lowermost part of the trap. The junction piece is shown in side view, so as to permit the known method of arranging the suction pipe G externally of the gas-main. The pipe is constructed in two parts, which are so screwed into a nipple K in the top of the water-trap that they may be readily detached and exchanged if required.

In the second arrangement, a spherical water-trap F is illustrated, connected to a flanged branch D on the junction piece A.

APPLICATIONS FOR LETTERS PATENT.

4616.—STORRAR, C. E., J. H., & R. A., "Globes." Feb. 23.
4632.—JAHN, F., and MYERS, R. P., "Gas flash-light signs." Feb. 23.
4673.—COUSIN, P. A. J., "Gas-producers." Feb. 23.
4696.—ALLISON, T. M., "Graders for coal or coke." Feb. 23.
4736.—MACNAB, W., and BELL, T. L. G., "Production of sulphite of ammonia." Feb. 24.
4791.—FULLWOOD, W. B., and FOSS, E., "Carburetting air." Feb. 24.
4799.—FIDDES, W. J, "Removing tarry particles from gases." Feb. 24.
4818.—KENT, W. G., and HOVENDEN, E. W., "Fluid meters." Feb. 24.
4825.—COMPAGNIE POUR LA FABRICATION DES COMPTEURS ET MATERIEL D'USINES À GAZ, "Coin-operated distributing apparatus." Feb. 24.
4829.—COMPAGNIE FRANÇAISE DU CENTRE ET DU MIDI POUR L'ECLAIRAGE AU GAZ, "Manufacture of illuminating gas." Feb. 24.
4850.—BAYER, J. F., "Casing for outdoor lamps." Feb. 25.
4920.—AKTIEBOLAGET LUX. "Flash-lighting apparatus." Feb. 25.
4975.—RICHMOND GAS STOVE AND METER COMPANY, LTD., and THORNTON, H. M., "Plate-racks for gas cookers." Feb. 26.
5000.—HALL, I., "Gas-burners." Feb. 26.
5003.—ELBORNE, S. L., "Fire-clay backs." Feb. 26.
5028-9.—MADGE, W. T., and WARREN, F., "Atmospheric burners." Feb. 26.
5051.—HOWL, E., and PERRY, F., "Purification of gases." Feb. 26.
5132.—SCHWYZER, E., "Safety device for preventing fire or explosion from gas." Feb. 27.
5142.—BARNUM, D. D., CARPENTER, H. A., and the RITER-CONLEY MANUFACTURING COMPANY, "Generating gas." Feb. 27.
5158.—SEVERIN, L., "Inverted mantles." Feb. 27.
5159.—RENDELL, A. W., "Fluid-compressors." Feb. 27.

Workington Gas-Works Extensions.—The Workington Town Council have agreed to a recommendation by the Gas Committee that a sum of £21,000 should be spent on the gas-works. It was explained that in 21 years the make of gas has increased by 124 per cent.; and that further plant is urgently required. An increased profit of £2560 is anticipated from the adoption of vertical retorts. The new works to be undertaken (on the recommendation of the Gas Engineer, Mr. Horace Chamberlain) are as follows: Retort-house, carbonizing plant on the Woodall-Duckham vertical retort system, and machinery therewith, £15,606; for duplicate generating set, £1500; for rotary washer, station-meter, meter-house, mains for gas, tar, water, and steam, tar dehydrating plant, fencing, siding, boundary wall, drainage, power house, weighing machine, testing, &c., and contingencies, £4394—thus making a total of £21,500.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills read the second time and committed: Leighton Buzzard Gas; Liverpool Gas Company; Manchester Corporation; Rhymney and Aber Valleys Gas and Water; South Bank and Normanby Gas Company.

A petition was presented by members of the Edenbridge Parish Council in favour of dispensing with the Standing Orders in connection with the Edenbridge Gas Bill.

A report was received from the Standing Orders Committee, read, and agreed to, that the Standing Orders not complied with in respect of the Skegness Urban District Council Bill should be dispensed with, and the Bill allowed to proceed.

The Llanfaelog Water Bill, British Gas Company (Hull Station) Bill, Stone Gas and Electricity Bill, Newport Corporation Bill, and Reading Corporation Bill have been referred to a Select Committee, consisting of the Marquis of Bath, Earl Onslow, Earl Harrowby, Lord O'Hagan, and Lord Avebury, to commence sitting on Wednesday, March 18. The Mexborough Water Bill is to be added to this group as soon as it has been read the second time.

HOUSE OF COMMONS.

The following Bills, which at their second reading were referred to the Examiners, have now been committed: Isle of Thanet Gas, Riddings District Gas, Southend Gas, Wadhurst and District Gas.

The following petitions against Private Bills have been withdrawn: Keymer and Ditchling Gas Company against the Hayward's Heath Gas Bill, Port of London Authority against the Southend Gas Bill, East Kent Light Railway Company against the Deal and Walmer Gas and Electricity Bill, London and North Western Railway Company against the Northwich Urban District Council Bill, Nottinghamshire County Council and Great Northern Railway Company against the Riddings District Gas Bill.

The Ashington Urban District Council Bill, Riddings District Gas Bill, Leyland Gas and Electricity Bill, and the Southend Gas Bill have been referred to a Select Committee consisting of Mr. Mount (Chairman), Mr. Watt, Mr. John Wood, and Mr. F. W. S. M'Laren; to commence sitting to-day, March 10.

South Suburban Gas Bill.

Notice is given of a motion after the second reading of this Bill that the Committee on the Bill be instructed to omit clause 38; this being the clause referring to the disposal of surplus electricity not required for gas-works purposes.

Market Rasen Water Bill.

Notice was given of a motion, after the second reading of this Bill, that the Committee on the Bill be instructed "to inquire whether the collecting, taking, and user of waters from the Bully Hill Farm Spring and the Little Ash Holt Spring, as proposed by the Bill, will or may prejudicially affect the River Rase and the existing public or private sources of supply in the district, whether from wells or underground sources or from streams or other surface waters, and that they have power to insert in the Bill such clause or clauses as they think necessary for limiting the quantity of water which the Company may collect, take, and use."

Gas Undertakings Returns.

The Board of Trade Returns relating to Gas Undertakings (local authorities and companies) were presented in the House of Commons, and ordered to be printed.

Wadhurst and District Gas Bill.

When this Bill last week came before Mr. Jeune, one of the Examiners of Standing Orders, the point was raised (although there were no opponents to the Bill) as to whether meetings of the shareholders of the old Ticehurst Company, whose undertaking is being acquired, should not have been held to approve it. In the course of the discussion, it was pointed out to the Examiner that the old Ticehurst Company is now practically defunct; and it was thereupon decided that the Standing Orders did not apply.

HOUSE OF LORDS STANDING ORDERS COMMITTEE.

SKEGNESS URBAN DISTRICT COUNCIL BILL.

This Bill came before the Standing Orders Committee of the House of Lords last Wednesday, with regard to clause 64—which provides that the Council may define the future line of streets—upon which the Examiners found that Standing Orders had not been complied with [see "JOURNAL," Feb. 10, p. 373].

Mr. C. E. BAKER (Messrs. Baker and Co., Parliamentary Agents) informed the Committee that the clause in question had been withdrawn.

The Bill therefore goes forward in the ordinary course.

EDENBRIDGE AND DISTRICT GAS BILL.

This Bill should have come before the Committee with respect to non-compliances reported by the Examiners [see "JOURNAL," Jan. 27, p. 242]; but consideration of it was postponed until their next sitting.

COURT OF REFEREES.

Questions of Locus Standi.

(*Before Mr.* WHITLEY, *Chairman, Mr.* E. MOON, K.C. (*Speaker's Counsel*), *Mr.* HILLS, *Mr.* MOONEY, *Mr.* STAVELEY-HILL, *Mr.* M'LEAN, *Sir* DAVID BRYNMOR JONES, *Sir* W. PHIPSON BEALE, K.C., *and Mr.* WHITE.)

On Tuesday of last week, the Court of Referees, constituted as above, had before them several Bills in which applications were made for *locus standi*.

WEYMOUTH AND MELCOMBE REGIS CORPORATION BILL.

In this case, the Weymouth Gas Consumers' Company had applied for *locus*. On behalf of Messrs. Dyson and Co. (the Parliamentary Agents for the Bill), however, it was stated that terms had been agreed allowing the Company limited *locus* with regard to Parts II. and III. of the Bill, for the purposes of asking for protection for gas mains and pipes. A number of other points which were objected to by the Corporation had been abandoned.

The Court allowed *locus* to the extent mentioned.

SOUTHEND GAS BILL.

The Port of London Authority, who had applied for *locus*, withdrew their petition.

DEAL AND WALMER GAS AND ELECTRICITY BILL.

The East Kent Light Railway Company, who had applied for *locus*, withdrew their petition.

OXFORD AND DISTRICT TRAMWAYS BILL.

The Oxford Gaslight and Coke Company, represented by Mr. FORBES LANKESTER, K.C., applied for *locus*, which was objected to by the Tramways Company, represented by Mr. J. G. TALBOT, K.C.

Mr. FORBES LANKESTER, on behalf of the Gas Company, said that the Bill authorized the pulling up of the existing horse tramways in the city, and the substitution of a service of motor omnibuses; and he desired to be heard before the Committee to ask for protection in regard to the gas-mains already laid. He related the somewhat complicated history of the tramways undertaking in Oxford, which had culminated in the present position—that the Tramway Company had, to all intents and purposes, abandoned the electric traction scheme. The Bill gave the Corporation powers to pull up the existing horse tramways and at the same time grant the Tramway Company a monopoly in the matter of licences to run motor buses.

Mr. STAVELEY HILL asked what damage would be done to the gas-pipes by the running of motor omnibuses.

Mr. FORBES LANKESTER maintained that the running of the buses might injure the pipes under the road. He was perfectly aware that anybody could run motor omnibuses without parliamentary powers. But if this were done, the buses were run at the risk of the person owning them; and if the Gas Company could show that the mains were injured by the running of the buses, the Gas Company would have a right of action. If, however, the buses were run under parliamentary powers, then the Gas Company would have to show negligence in carrying out the statutory powers before they could recover for any damage done.

Mr. M'LEAN: That is rather a large proposition.

Sir PHIPSON BEALE: Is there any authority for this? If a man puts some vehicle upon a road which it is not constructed to bear, is there any authority that he is liable for damage done?

Mr. FORBES LANKESTER said he took it that it was the same as in the case of a heavy steam-roller. There had been many cases in which extraordinary traffic of this sort had been held liable for damage to pipes and mains. He also claimed *locus* as an owner of property which might be injuriously affected, and also as an owner of property which might be taken under the Bill. With regard to the pulling up of the tramways, the position he was in was that whereas under the Tramway Company's Acts of 1907 and 1909 there was protection afforded to the Gas Company, by giving the Corporation power to remove the tramways, the Tramway Company were now depriving the Gas Company of the protection which they at present had.

Mr. TALBOT interposed that the Gas Company were not interested in any land or property for the purchase of which an extension of time was asked for in the Bill.

Mr. FORBES LANKESTER pointed to the Brighton and Hove Corporations Act of 1912, dealing with trolley omnibuses, in which protection was given to the Company by a Committee of the House of Lords.

Mr. TALBOT, on behalf of the Tramway Company, said that the Court would probably gather from the arguments that very serious consequences were not apprehended from the operations of the Bill. With regard to protection for the Gas Company in respect of taking up the tramways, section 66 of the Act of 1907 had been specifically agreed with the Gas Company for this purpose; and all that was done now was to substitute the Corporation for the Company to carry out the same operation under the same conditions and in the same circumstances. He submitted that there was no *locus standi* with regard to this to the Gas Company, as, quite apart from this special provision, the Gas Company were sufficiently protected by the Tramways Act of 1870, and this had been the practice of the Court. No fresh circumstances had arisen to justify *locus* being granted to the Gas Company to appear before the Committee to ask for special protection, having regard to what the Bill proposed. The point made as to a gas company being heard against a proposal to run motor omnibuses was an entire novelty, and was the very height of absurdity in this case, because the Tramway Company were at the present time actually running buses in

the streets by licence. All that the Bill enabled the Corporation to do was, in consideration of the other provisions of the Bill, to grant the Tramway Company the exclusive right to run motor buses in the streets of Oxford. He maintained that there was no liability attaching to the running of motor omnibuses as regards pipes under the streets.

Mr. MOON: There is no Common Law liability in this matter.

Mr. FORBES LANKESTER said that under sub-section 5 of clause 3 of the Bill the Company would be put in a totally different position to any ordinary person running motor buses, because they were to have the exclusive right to work and run motor omnibuses within the city. This gave an actual statutory right; and in these circumstances it was only possible to recover for damage done if negligence in exercising these parliamentary powers could be shown. The point was that if the Tramway Company were liable as ordinary undertakers for any damage done, they would not be liable as parliamentary undertakers.

The CHAIRMAN announced that the *locus* in this case would be disallowed.

NORTHWICH URBAN DISTRICT COUNCIL BILL.

In the Bill promoted by the Northwich Urban District Council, the Weaver Navigation Trustees, represented by Mr. BALFOUR BROWNE, K.C., applied for *locus*. The Council were represented by Mr. J. G. TALBOT, K.C.

Mr. BALFOUR BROWNE explained that the Bill confirms the existing water-works and authorizes the extension of them by allowing the Council to take more water from the watershed feeding the River Weaver. The extra water was required apparently for the purpose of supplying some of the districts outside the urban area; and the result of taking this extra water would undoubtedly have a serious effect upon the navigation. Already the water abstracted by the Council, which was limited to 300,000 gallons per day, had its effect upon the working of the waterway, which was a most important matter to Cheshire, for there was a traffic of no less than 1,000,000 tons per annum upon it. Under the Bill there was no limit to the amount of water which the Council could extract from the river; and assuming that the present limit was doubled, and that 600,000 gallons per day were taken, it would have the effect of reducing the carrying capacity of the canal by 1000 tons per day. He claimed to be heard against the Bill as one seriously affected by the proposals in it, and also as an owner and ratepayer in the district, although the latter was a subsidiary point.

Mr. TALBOT, on behalf of the Council, said that the practice of the Court was to decide the question of abstraction of water from a navigable waterway as one of degree; and it was not the custom to grant *locus* unless evidence was given that there was every likelihood of serious damage being done. There was an absolute misapprehension in the minds of the petitioners in this case as to what was intended under the Bill. It was true than an additional well was to be sunk, and that further borrowing powers, amounting to £20,000, were being sought; but all this would be necessary for the purposes of the existing area, even if the additional area were omitted from the Bill. In any case, money to be spent upon the needs of the proposed additional area would have to be sanctioned by the Local Government Board. The watershed of the River Weaver was 550 square miles; whereas the total population in the Northwich area of supply was only 20,000. The Council were already taking water from this watershed; and there was not the smallest allegation that anything that had been done up to now had had a serious effect. The works of the Council were situated upon the Coote Brook, which was a tributary of the Weaver. They were five miles away from the river itself; and the additional population in the new area proposed was only 2000. It did not necessarily follow that because an additional well was being sunk more water would actually be taken from the sources supplying the River Weaver.

The CHAIRMAN: Is it a matter of degree of likely risk?

Mr. TALBOT: Yes.

Mr. *J. A. Saner*, the Engineer to the Weaver Navigation Trustees, gave evidence in support of what Mr. Balfour Browne had said.

The CHAIRMAN announced that the Court thought there was sufficient *primâ facie* evidence to support the allegation that the petitioners might be injuriously affected, and allowed the *locus*.

BRENTFORD GAS BILL.

HOUSE OF LORDS COMMITTEE.—Wednesday, March 4.

(*Before Lord* HYLTON, *Chairman*, *Lord* HOLLENDEN, *Earl of* LEICESTER, *Lord* ELPHINSTONE, *and Lord* SACKVILLE)

This Bill, promoted by the Brentford Gas Company, proposes to acquire land at Chiswick for the erection of a new gas-works, to acquire the Staines and Egham and Sunbury Gas Companies, to apply for Electric Lighting Provisional Orders, &c.

The promoters were represented by Mr. HONORATUS LLOYD, K.C., Mr. G. J. TALBOT, K.C., Mr. MOON, and Mr. F. S. BAKER. The opposition to the Bill was as follows: Hammersmith Borough Council, represented by Mr. PAGE, K.C., and Mr. R. BROWN; the Metropolitan Electric Supply Company, represented by Mr. BALFOUR BROWNE, K.C., and Mr. TYLDESLEY JONES; the Barnes Urban District Council, represented by Mr. BALFOUR BROWNE, K.C., and Mr. SZLUMPER; the Chiswick Urban District Council, represented by Mr. COWARD, K.C., and Mr. TYLDESLEY JONES; the Twickenham and Heston and Isleworth Urban District Councils, represented by Mr. W. J. JEEVES; the Richmond Corporation, represented by Mr. SZLUMPER; and the Staines and Feltham Urban District Councils, represented by Mr. C. L. ATTENBOROUGH. Counsel were reserved by the following parties: Wandsworth Borough Council, Great Western Railway Company, Sunbury-on-Thames Urban District Council, Port of London Authority, and Metropolitan Water Board. There are one or two other petitioners who may appear in person.

Mr. HONORATUS LLOYD, in opening the Bill, said that it was promoted by the Brentford Gas Company. One of the most, if not the most, important proposals was to authorize the utilization of some lands provisionally purchased from the Duke of Devonshire for the purpose of a new gas-works at Chiswick. Another object was to authorize the Company to convert their capital, with a view to bringing the nominal capital more in accord with the actual value of the stock; while yet another object was to make provision for the acquisition of the undertakings of two comparatively small adjoining companies, and to apply the provisions of the sliding-scale, already existing in the Company's present area, to the areas of the two companies which it was proposed to purchase. The Bill also proposed to extend the Company's district by taking int he parish of Laleham; and, further, powers were asked to apply to the Board of Trade for Provisional Orders for supplying electricity, or to take over by agreement the undertakings of authorities owning Electric Lighting Provisional Orders. Among the miscellaneous provisions of the Bill was the supply of a cheap class of gas for power purposes. Dealing with the various proposals more in detail, Counsel pointed out that the Company was incorporated in 1821, and at that time was authorized by Parliament to supply in the towns of old and new Brentford, and the villages of Turnham Green, Hammersmith, and Kensington, in Middlesex. The original capital was £30,000 in shares, and a further sum of £7500. In 1858, the Company was authorized to raise further capital; while the limits of the area of supply had been altered from time to time under various Acts and Orders. They were now carrying on a very large business under modern legislative powers, and, he believed, were the first Company to adopt, among other modern provisions, the sliding-scale. The Company possessed gas-works at Brentford, and also at Southall, where there was still a considerable area available for development. But, owing to the rapid growth of the Company's business, the Southall site was a comparatively uneconomical one for gas-works purposes, having regard to its position, the manner by which access was obtained to it for bringing coal and other materials, and the means by which residuals had to pass from it. The result was that the gas manufactured there was comparatively dear; and it was essential in the interests of the supply of cheap gas that a more economical site should be chosen. It was with this end in view that terms had been arranged with the Duke of Devonshire to take over a site on the river at Chiswick. The site was on low-lying land and unfit for building purposes, for which it was the original intention to use the land. It was an admirable spot for industrial purposes; and although under the Standing Orders it was necessary for the Company to give notice to all owners and occupiers within a distance of 300 yards of the land proposed to be taken, as a matter of fact there were hardly any such persons upon whom to serve notices. This demonstrated how admirably suitable the site was for the purpose. It had a considerable frontage to the river, and also communication with the London and South-Western Railway. The manufacture of gas on the Southall site actually cost a little more than did gas manufactured at the Brentford works. One of the reasons for this was that the coal had to be barged up a canal which had a series of locks. Another reason was that the site was so far from the centre of the district that the coke had to be sent away by train; whereas at the Brentford works purchasers brought their own carts and took it away immediately. The cost at Southall was something over 2d. per 1000 cubic feet more than at Brentford, which was obviously a most important matter to the consumers as well as to the shareholders. With regard to taking over the Sunbury and the Staines and Egham Companies, although these concerns dealt with comparatively large areas, the gas-works there were very small in comparison with the Brentford undertaking. The parish of Laleham, which it was proposed to add to the Company's district, was already supplied by the Staines Company, although they had no statutory powers to do so. The comparative size of the undertakings would be seen from the following figures of capital:—

	Share Capital.		Loan Capital.
Brentford Company	£1,180,000	..	£300,000
Staines and Egham Company . .	70,000	..	17,500
Sunbury Company	20,000	..	5,000

It was not suggested that at the outset the Brentford Company would obtain any great advantage as a result of the acquisition of these two Companies. But there was little doubt that eventually there would be an enormous advantage to the Company; while immediately the transfer took place, the two smaller Companies would benefit to a very considerable extent. They would be taken into the larger Company and made subject to their dividends; while at the same time there would be great reductions in the price of gas to the consumers. At present in Staines the price charged was 2s. 9d. per 1000 cubic feet; but the intention was to reduce this by 2d. at once, to 2s. 7d. until 1917, and then by 1d. a year until the price at present charged at Brentford (2s. 4d.) was reached. In Sunbury the present price was 4s.; but a 6d. reduction would be immediately made (making the charge 3s. 6d. per 1000 cubic feet), and subsequently the price would be reduced by 2d. a year until, in 1922, the same price as was charged in Brentford now would be reached. At the same time, the larger production which the increased area would involve would enable the Brentford Company to generate more cheaply, and make reductions in price which under present conditions would not be possible. The next important part was with regard to the conversion of capital. The object was to transfer the stock from the original nominal to a sum which more nearly represented its value in the market to-day. It made no difference either to the consumer or to the shareholder. But it prevented disproportionate values being quoted on the Stock Exchange; and he did not know that anybody would object to it, as it had been sanctioned by Parliament many times. [The details would be given by the accountant]. It was the intention to purchase the other two Companies on the terms of paying them in Brentford stock. In this connection, he drew attention to a somewhat curious anomaly in the petitions; for whereas the local authorities in the existing area complained that the two Companies to be purchased were being treated on too favourable terms, the local authorities of Staines and Egham and Sunbury complained that the terms were not favourable enough. If, however, the Committee divided these objections by two, he thought it would be found that the Brentford Company had done what was really fair as between the various authorities concerned.

Thursday, March 5.

Mr. HONORATUS LLOYD, continuing his opening statement this morning, dealt with the proposed powers to apply to the Board of Trade for Electric Lighting Provisional Orders, and also to take transfers of Orders from local authorities or companies already owning them. The point which was to be raised here, apparently, was the old one of whether it was desirable to entrust gas undertakings with the carrying out of electric lighting powers. The opposition stated that it was adverse to the public interests, because it would more or less squelch electrical enterprise, inasmuch as gas companies would be tempted to push the sale of gas in preference to the sale of electricity. But when the opposition came to be examined, it would be found that there was really nothing in it, and Parliament had sanctioned it on many occasions. Indeed, many companies were now successfully working both electricity and gas undertakings. Furthermore, he wished to emphasize that the Bill did not create a new electric supply authority, as many of the opponents seemed to imply in their petitions, but merely gave the Company powers to apply to the Board of Trade for an Electric Lighting Order, at which inquiry any opponent would be heard. Similarly, any proposal to take a transfer of an Electric Lighting Provisional Order was subject to the consent of the Board of Trade, before whom, again, any opponents would be heard. A point which would come up for discussion under the miscellaneous provisions of the Bill was in regard to the charges for public lamps. When the 1868 Act was passed, gas was used for no other purpose than lighting; and, in consequence, it was only fair that a clause should be inserted specifying that the local authorities should be supplied with gas for public lighting purposes at the lowest price charged to any other consumer. Since then, however, gas had come to be used very largely for motive power and heating purposes; and consequently it was unfair that this condition should continue. The existence of this provision was having the effect of handicapping the Company in developing the supply of gas for power purposes, because, if they supplied a large user of gas for power purposes at a very low rate, this low rate would have to be allowed to the local authorities for public lighting. Under the Bill it was sought to add words in clause 66 to obviate this, and to charge the local authorities for public lighting a price equivalent to the lowest charge to lighting consumers.

Mr. PAGE, for the Hammersmith Borough Council, pointed out that the proposal was to supply a different gas for power purposes.

Mr. HONORATUS LLOYD said this was another matter altogether. What he had been speaking about was ordinary coal gas. The question of supplying a different kind of gas was dealt with in clause 70, in which a cheaper quality of gas was sought to be authorized to be supplied for power purposes. This involved the laying of separate mains. The opposition to this was mainly from local authorities, who nominally objected to the streets being broken up for the purpose. He had a strong suspicion, however, that underlying this opposition was the fear that power gas would compete, as it undoubtedly would, with the existing electricity undertakings. But he maintained that power users should be able to obtain a supply of gas or electricity at the cheapest possible rates. The Bill also proposed to exclude certain sections of the Gas-Works Clauses Act, which would not be applicable to the supply of power gas. Clause 82 raised yet another important matter upon which discussion was likely to arise. This was commonly known as the stand-by clause. Counsel explained how gas companies were compelled to supply any consumer, and how many users of producer gas plants take a supply only for starting-up their plant, with the result that the gas company are put to a large capital expenditure in mains and machinery in order to afford this supply; but the financial return was very little indeed. The clause in the Bill reads as follows:

> Notwithstanding anything contained in the Gas-Works Clauses Act, 1871, or any other Act, a person shall not be entitled to demand from the Company a supply, or the continuance of a supply, of gas for premises having a separate supply either of gas or electricity—that is to say, a supply from an installation other than that of the Company—unless he shall have previously agreed to pay the Company such minimum annual sum as will give to them a reasonable return on the capital expenditure and the standing charges incurred by them to meet the possible maximum demand for the premises; and the minimum annual sum to be so paid shall be determined, in default of agreement, by arbitration in manner provided by the Arbitration Act, 1889.

This was somewhat more drastic than the usual clause of this character, inasmuch as it would make it obligatory upon any consumer, however small, who, for instance, might have a few electric lamps in his house, to pay the minimum stand-by charge. But this was a principle which had not hitherto been recognized by Parliament. There was a less drastic form of the clause in the Swansea Act last year; and he would place this before the Committee later as the one to go into the present Bill.

PETITIONS.

Coming to the petitions, Counsel dealt first in detail with that of the Barnes Urban District Council. As most of the points covered by it were also dealt with in other petitions, the latter were not referred to. The first point was an objection to the Chiswick site, on the ground that it would spoil the amenities of the district by obstructing the view across the river. While the Barnes Urban District Council or anybody else had no right to an exclusive view across the river, arrangements had been made whereby a considerable belt of land along the river front behind the retaining wall would be planted with trees, in order to preserve the amenities of the district as much as possible. Objection was taken to the site also on the ground of nuisance. But it was pointed out to the Committee that, under the conditions of modern gas manufacture, no excuse could be offered for creating a nuisance; and none would be created. Another point against the Bill was in regard to the conversion of capital—it being alleged that the cost of this would fall upon the consumers. It was a fact that, under the Finance Act, stamp duty had to be paid in respect of converted capital; but he could not regard it as a matter of great import. Powers were asked in the Bill to borrow one-fourth of the nominal amount of the capital issued at the time of borrowing; and it was suggested that this should be the usual one-third. To this the Company had no objection. The effect of the Council's opposition to the capital conversion scheme would be to create a third class of stock instead of two as at present. This point again would be dealt with in detail by the Accountant. Complaint was made that no definite electric supply scheme was included in the Bill, and that in consequence the clauses should be struck out. Considerable importance attached to the question of the test which should be applied to the Company's gas; and several petitions raised this point. At present the Company were working under an illuminating power test, which most gas authorities recognized as being antiquated and unsatisfactory. This point had been discussed on many occasions; and it was quite conceivable that a better means of testing gas than by the illuminating power—having in mind that all lighting practically depended upon the heating of mantles—would be arrived at. As a matter of fact, important experimental work had been going on in this direction, with the result that the Gas Light and Coke Company had presented a Bill this year which would be subjected, he might put it, to a full-dress debate by the London County Council, with a view to ascertaining what was the best test for calorific value, and whether or no it was advisable to have both an illuminating power test and a calorific value test. Gas authorities did not care much which, although they believed the calorific value test was the more suitable. They did think, however, that to have the double test would be unfair. The London County Council had presented a petition against the Bill; but by agreement they reserved their opposition, so far as the House of Lords was concerned, on the understanding that the Brentford Company would abide by any decision come to on the Gas Light and Coke Company's Bill.

Mr. BALFOUR BROWNE, for the Barnes Urban District Council, said that, although he was speaking without instructions, this course seemed satisfactory.

Mr. PAGE, for the Hammersmith Council, pointed out that this left open the question of whether there should be one test or two.

Mr. LEWIS COWARD, for the Chiswick Urban District Council, said he was satisfied with Mr. Lloyd's suggestion.

Mr. W. J. JEEVES, for the Twickenham and Heston and Isleworth Councils, said he asked for both tests. He was prepared to accept Mr. Honoratus Lloyd's suggestion as to the calorific test if he would give a modern illuminating power test, as had been done in the Wandsworth Company's Act.

Mr. HONORATUS LLOYD said that, in his opinion, the two tests were incompatible.

Mr. BALFOUR BROWNE asked as to the position in the event of the Gas Light and Coke Company's Bill (which was to do away with the illuminating test) being rejected. What would be the effect upon the Brentford Bill then?

Mr. HONORATUS LLOYD said this raised the question of two tests; and apparently he would have to ask the Committee to decide this. The Company believed that it was to the interests of everybody to have the calorific test.

Mr. BALFOUR BROWNE replied that he was not going to ask for the Company to be put under two tests.

Mr. HONORATUS LLOYD said he had just been told that, under the arrangement whereby the London County Council did not appear against the Brentford Bill in the House of Lords, the Company had agreed to stand by the decision in the case of the Gas Light and Coke Company. If the latter had one or two tests put upon them, these provisions would go into the Brentford Bill.

Mr. JEEVES said that, put in this way, he was prepared to accept the suggestion, on the understanding that if two tests were to apply to the Gas Light and Coke Company they should also apply to the Brentford Company.

Mr. HONORATUS LLOYD remarked that, under the circumstances, the Committee did not appear likely to be troubled with any prolonged discussion on the test. In briefly running through the remainder of the petitions, special attention was drawn to that of the Chiswick Urban District Council, who complained that to place the supply of electricity in the hands of the Gas Company might tend to stifle the proper development of electric supply. The curious point about this was that, until quite recently, the Chiswick Council proposed to purchase the Chiswick Electric Supply Company, with a view to transferring it to the Brentford Gas Company. It was only as a result of a poll of ratepayers that the project was dropped. Finally, reference was made to a report by the Board of Trade upon the Bill in regard to clause 63, which deals with the transfer of Electric Lighting Provisional Orders to the Company. This report expressed a doubt as to the expediency of a gas company being empowered to acquire electrical undertakings, and suggested that if the clause was allowed it should follow the form adopted in recent Electric Power Acts, and incorporate the provisions of the Electric Lighting Act, 1909. Further, having regard to the powers conferred upon the London County Council as to the purchase of the London Electric Supply Companies, the clause should not in any event apply to the Administrative County of London. Counsel pointed out to the Committee that Parliament did not always follow the Board of Trade in this matter; for a large number of gas companies were successfully running electricity works. He only asked the Committee, if he satisfied them on the point, to grant him the powers asked for.

EVIDENCE ON BEHALF OF THE PROMOTERS.

Mr. *A. A. Johnston*, the Engineer and Manager to the Brentford Gas Company, said the Company was incorporated in 1821, with a total capital of £37,500. In 1858, the capital was increased to £229,700; while the area of supply was also extended by the addition of several other districts in Middlesex and Surrey. The last extension of the area of supply was in 1868, and the total was now 49 2 square miles. The original works were erected in 1821 at Brentford. In 1868 the Southall site was authorized; and at the same time the capital was increased to a total of £542,000, including borrowing powers. The total land now held by the Company at Southall was 73·68 acres, of which 53·41 acres had been authorized for gas manufacture. At present, however, only 17 acres were occupied by gas manufacturing works, and 6 acres by works for dealing with residual products. It was in 1881 that the sliding-scale was applied to the Company; and

their progress since had been so rapid as to render absolutely essential the construction of new works somewhere. The Company had now reached the stage when it was necessary to spend a considerable amount of capital in the construction of an entirely new works; and as the Brentford site was almost dangerously congested, and the Southall site in an uneconomical position, the Chiswick site had been chosen as a way out of the difficulty. The present rate of progress was that the business doubled itself in thirteen years. The capacity of the plant was 15,380,000 cubic feet of gas per day (when some purifiers now being installed were completed); and this would be increased to 16,000,000 cubic feet per day by the addition of a small installation of retorts. The demand for the week ending Jan. 24 last was 14,254,333 cubic feet per day; and he estimated that during the winter of 1916-17 the total capacity of 16,000,000 cubic feet would be absorbed. In 1898, less than half the total output was made at Southall; whereas now nearly two-thirds of the output was made there—demonstrating that Brentford had been up to its limit for a considerable time. As a further instance of the uneconomical production at Southall, he mentioned that there was a difference of 2s. 9d. in the cost of coal in favour of Brentford, of which 1s. 3d. per ton consists of extra cartage. The difference between this and the 2s. 9d. was due to local expenses; and he was content to take the actual difference at 1s. 3d. There was, however, an advantage of 4d. per ton in favour of the Chiswick site as compared with Brentford; the latter figure being based upon actual quotations from the present coal contractors. Another important reason for not wishing to extend further at Southall was the difference in the price of coke sold there as compared with that sold from the Brentford works. Coke at Brentford during the past four years had fetched from 1s. 3d. to 1s. 7d. per ton more than did that from Southall, owing to the cost of cartage from the latter works. He estimated that the total difference in favour of the Brentford works over Southall, due to the higher cost of coal and the lower price they received for coke, was equivalent to 1·98d. per 1000 cubic feet of gas made; whereas the advantage of Chiswick over Southall would be equivalent to 2·2d. per 1000 cubic feet. The first instalment of the plant which it was proposed to erect at Chiswick would be capable of an output of 5,000,000 cubic feet of gas per day—sufficient to carry the Company on for five or six years from 1916. His estimated capital expenditure during the next ten years amounted to £876,500; but the Bill was only asking for new capital powers to the extent of £800,000, which did not seem to him an extravagant amount. Apart from the estimated capital expenditure upon new works, a sum of £476,500 (included in the above) was estimated as being necessary to be spent upon the undertaking generally during the next ten years. Dealing with the electricity powers, witness pointed out that there was no intention on the part of the Company to enter into competition with existing electric supply authorities, but merely to undertake a supply, and, incidentally, make use of much waste heat available at the gas-works, in those districts where no electric supply was at present available. He maintained that in many respects a large gas company were in a much better position to produce electricity economically than an ordinary electricity company, and especially a small one. For power-gas purposes it was intended to use the coke. But owing to the operation of the clause as to the price of public lighting, the Company were not at present able to compete with suction-gas plants, many of which were in use in their area. For instance, there were near the Southall Gas-Works several very large works using their own gas plant, to which the Company had had to lay an 18-inch main. These gas-engines, he believed, could be replaced by cheap power gas. The conversion of the capital would increase the value of the stock and enable the Company to raise on much more favourable terms the considerable amount of capital which would shortly be necessary. At present the value of the stock was much too low; but the conversion would have no effect on the sliding-scale. The capital cost of the Company was one of the lowest in the kingdom, being only £341 per million cubic feet. The area of the Company, if the new districts were added, would be 91·9 square miles, compared with 49·2 square miles at present.

Mr. BALFOUR BROWNE spent a large portion of the afternoon in cross-examining witness on behalf of the Barnes Council and the Metropolitan Electric Supply Company. On behalf of the former, he put a considerable number of questions as to the Chiswick site, and remarked that as the effect of coming lower down the river from Brentford would be to reduce the cost of coal, why did not the Company go further down the river? Council eventually found himself suggesting a site as far down as Barking; but witness gave him the obvious reply that this was beyond his Company's area. The effect upon boating on the river, due to the alleged large quantities of coal dust which would be in the atmosphere, was discussed; and the possibility of the Company buying the Montgomery Wharf, Brentford, was gone into. Witness replied that no gas engineer would ever construct another Brentford works. An attempt was made to attach considerable importance to the previous policy of the Brentford Company in purchasing the Southall site; but it was pointed out that conditions had changed considerably since this land was purchased. Then there was a ready sale for residual products which did not now exist. At the present time all the coke had to be sent away by train, in addition to there being the extra disadvantage of the higher price of coal already referred to. Counsel then went back to the Chiswick works, and drew attention to the evil effects upon the district generally, more particularly if the whole of the Company's supply was eventually concentrated there. Witness agreed that the site would be capable of accommodating plant which would turn out 45 million cubic feet of gas per day; but he did not anticipate that this would take place for many years. As to whether the Sunbury and Staines works were to be continued, witness would not pledge himself beyond saying that certainly the Sunbury works would not be continued. On the question of public lighting, Counsel maintained that there was no reason why the lowest price at which gas was supplied by the Company for any purpose should not be charged to the local authorities. Witness, however, replied that already under the Company's Acts local authorities could not claim for public lighting the price at which any railway company in the area was supplied if this were the lowest price, and said he thought the same principle should apply to gas supplied in very large quantities to factories for industrial purposes. Dealing with the electricity powers, witness emphasized the point already made—that it is not the intention to set up any competition, except competition in bidding for the purchase of an existing Lighting Order.

In reply to Mr. PAGE, for the Hammersmith Borough Council, witness agreed that the electricity clauses might be so worded as to exclude from their operation any existing electric supply authorities, and, further, to exclude any combinations of local authorities which could be set up under the Electric Lighting Act of 1909.

Friday, March 6.

On the resumption of the proceedings this morning,

Mr. PAGE continued his cross-examination, and dealt with the question of the public lighting charge. Witness said that the present lowest charge for private purposes was 1s. 10½d. per 1000 cubic feet; but it was not intended to increase the public lighting charge. The whole object of clause 66 was to be able to lower the charges for power purposes—still charging the public authority the lowest charge made for lighting purposes. Counsel maintained that the effect of clause 66 would be to give the Company the right to increase the public lighting charge.

The CHAIRMAN interposed with the remark that the Committee had the point quite clearly in their minds. From their respective views, both Counsel and witness were right.

Mr. PAGE said witness was dealing with the object of the clause; whereas he was dealing with the effect of it.

Witness would not agree that the effect of the clause would enable the Company to increase the public lighting charge. He was able to supply gas for lighting at a profit at 1s. 10½d. per 1000 cubic feet; but he could supply for power purposes at a cheaper rate. It was the intention to manufacture power gas at Chiswick or Southall, according to where the demand arose. But the amount of land or capital required for power-gas purposes could not at present be determined. The power gas would be water gas, with a calorific value of about 300 B.Th.U. It could be used in an incandescent burner; but there was no intention of employing it for lighting purposes. He could give no idea of the size of pipes which would be required for power purposes; but he did not anticipate that the size would be any greater than ordinary coal-gas mains. It depended upon the pressure. Counsel then went on to refer to leakages from the existing low-pressure mains, which, said witness, was inevitable over a large system. Although it was always very small, the possibility of leakage into the Council's electric main conduits, and consequent explosion, was so much greater. Counsel suggested that the pressure at which the power gas would be supplied would be 14 or 15 lbs.; but witness did not agree. In any case, if the Council's electric mains did not leak there would be no explosion. Counsel indicated that as the Council were the local authority the Gas Company must take the necessary precautions to protect the electric mains. On the question of an increased number of pipes in the streets in consequence of the supply of power gas, and also carrying away residuals, witness said that power-gas mains would only be laid wherever necessary, and certainly not in every street or every main street. Pipes for carrying away residual products would most distinctly not be laid in main thoroughfares. Counsel wanted the clause altered to give the Hammersmith Borough Council a veto as to which streets should be broken up, either for laying power mains or pipes to deal with residuals.

Mr. LEWIS COWARD, who appeared, together with Mr. TYLDESLEY JONES, for the Chiswick Council, next cross-examined witness. The serious point in the Council's petition was interference with the amenities of the district. Witness maintained that there are no houses within range of the proposed works which could complain of a nuisance. In any case, there would be no nuisance. Already close to the site there were the sewage-works, which must cause more nuisance to existing houses than anything the gas-works could introduce. The gasholder might have a height of 150 feet.

[At this point, Counsel introduced a plan sent by the Agents of the Duke of Devonshire to the Chiswick Council in 1907, showing how the land could be laid out as a building site. This was in answer to the allegation by the promoters that the land could not be developed as a building estate.]

The CHAIRMAN: But we cannot dismiss from our minds the fact that the Duke of Devonshire is now a willing seller of the land to the Gas Company.

Mr. COWARD said it was of considerable importance to remember that the land was at one time intended to be laid out as a building estate. What was the price being paid per acre?

Witness objected to answering the question.

Mr. COWARD pressed the question, and appealed for a decision of the Committee.

The CHAIRMAN said he was not sure that the question should be answered.

Mr. COWARD said it was important, because the figure seriously affected many questions, including the price of gas.

Witness said the cost of the land was included in the total estimated capital expenditure already given; and so the effect upon the price of gas could be ascertained.

The CHAIRMAN, after consulting with the Committee, said that perhaps the question had better be answered.

Witness said the price was £550 per acre for the 90 acres.

Mr. COWARD then referred to objections by traders and others in Chiswick, remarking that the Company had, by suggesting going to Chiswick, brought a hornets' nest about their ears to save 2d.

Witness: Twopence! Twopence per 1000 cubic feet; and a very serious matter to 71,000 slot-meter users. It may not be a very serious matter to the Chiswick Council.

Under the Bill, powers are taken to build workmen's houses; and Counsel put it that when the Chiswick works were completed, the influx of a large working-class population would seriously increase the education rate. He repudiated the suggestion made by Mr. Honoratus Lloyd that the Council intended to purchase the Chiswick Electricity Company, and transfer it to the Brentford Gas Company. Some informal negotiations had taken place; but the Council officially repudiated them. Witness did not assent to this; and in reply to Counsel,

who remarked that the matter should not have been mentioned, said that in that event the point should not have been mentioned in the Council's petition against the Bill.

Mr. JEEVES, for the Twickenham District Council, argued that the capital conversion scheme would place burdens upon the consumers and benefit the existing shareholders. Further, in consequence of the scheme, ½ per cent. for the special purposes fund would amount to £8300; whereas at present ½ per cent. would only amount to £3800. This was again taking money from the consumers, remarked Counsel, who then proceeded to attack the estimates of witness as to increased gas consumption in the future. There was considerable difference of opinion between Counsel and witness on this matter, as Counsel insisted upon confining his questions to the Brentford area, whereas witness claimed the right to include the areas now proposed to be added. The point was that the amount of capital asked for was excessive. In answer to further questions, it was stated that the estimated capital expenditure includes £25,000 upon the Southall works, which will then have an effective output of 1,750,000 cubic feet per day more than at present. This extra amount, however, was included in the 16 million cubic feet per day mentioned in evidence-in-chief the previous day. Other questions related to the possibility of the Twickenham and Heston areas, among others, having to bear the burden of the reduction in price in the Staines and Sunbury areas. But witness contended that, after a long experience of suburban supply, it was the invariable effect that such large reductions in price as were proposed created an increased demand which more than compensated for the reduced revenue due to the reduced price. Counsel next asked for the provision of testing-stations both in Twickenham and Heston—a proposal objected to by witness on the score of expense and as unreasonable. For such an area two testing-stations would be sufficient; and these should be available for use by other local authorities. The stations would be on the trunk mains.

Mr. ATTENBOROUGH, on behalf of the Staines, Sunbury, and Feltham Councils, first of all dealt with the possibility of the Brentford Company purchasing the Egham and District Electric Supply Company, now supplying Staines with electricity, and claimed that this would be bad for the consumer. Witness, however, held the view that if this were done—there was no such intention at present—it would be better for the consumer, as the Gas Company could supply electricity cheaper than a small independent electric supply company. Complaint was also made that, as the Sunbury and Brentford areas were coterminous, the position, if the Bill passed, would be that consumers on one side of the street in the Brentford area would pay 2s. 4d. for their gas, while consumers on the opposite side, in Sunbury, would have to pay 3s. 6d. The reply was that the Sunbury consumers must bear the capital expenditure on the undertaking until such time as the price could be reduced to the Brentford figure. In a discussion upon the point that the candle power in Sunbury was now 15, whereas under the Bill it would be reduced to the Brentford figure of 14, Counsel caused some amusement by stating that the difference in the cost of manufacture in favour of the lower candle gas was 3d. per 1000 cubic feet.

In reply to Mr. SZLUMPER, for the Richmond Corporation, who were apprehensive that the local Electric Supply Company would be absorbed by the Brentford Gas Company, witness refused to assent to excluding Richmond from the clause giving the Company power to take transfers of Electric Lighting Provisional Orders, especially as such trensfers were subject to the consent of the Board of Trade and of the local authority.

A few questions were then put by Mr. WOODWARD, on behalf of himself and some other property owners near the Chiswick site. The purport of them was that the establishment of gas-works on the site would depreciate the property.

Mr. HONORATUS LLOYD very briefly re-examined witness. Dealing with the much-discussed amenities of the river in the Chiswick district, attention was called to the fact that, in addition to the sewage-works, there is a brewery and a motor garage on the river. Higher up there are some main-drainage works on the Barnes side, together with a refuse destructor; while close by are the Richmond Gas-Works, well up on high ground, to say nothing of the power station of the Chiswick Electricity Company. If the third class of stock was created, as suggested in one or two of the petitions, under a different sliding-scale to the present stock, it would, said witness, considerably handicap the Company in issuing new capital, as it would have to be issued below par, owing to the lower rate of dividend available upon it. There was no possibility of leakage from power-gas mains, as welded steel pipes were now available for pressures up to 2000 lbs. per square inch. A general objection was made to establishing testing-stations in the area of every local authority; and as an example of the futility of doing so, mention was made of the testing-station at Mortlake, which was constructed 45 years ago, at a cost to the Company of £3000, but only once had the Mortlake Council taken the trouble to test at it.

Mr. *E. H. Stevenson* generally agreed with the previous evidence. The consolidation of the capital of gas companies had now become a common matter in parliamentary proceedings. During the past fifteen years a great number of companies had dealt with their capital in the way proposed by the Bill. All that it did was to alter the nominal value of the capital, and the percentage for distribution; it did not alter the amount of money which could be distributed. He looked to a very great development of the Company's business in the Staines and Sunbury areas, as, owing to the high prices hitherto charged in these districts, the development had not been so rapid as it would otherwise have been. He testified to the congested state of the Brentford site, where it was necessary to stack coal under conditions which might easily become dangerous. As an example of the congestion, he mentioned that in order to instal some additional machinery it had been necessary to construct an iron and concrete structure practically over an existing building. He regarded the Chiswick site as an admirable one in every respect for gas-works. It was certainly not a site for building houses. He was surprised that houses had been built as near as they were to the existing sewage-works, as there was always smell from bacteria filters.

Mr. BALFOUR BROWNE: You are not a sewage engineer.

Witness: Yes I am. I am constructing some sewage works now.

Continuing, witness referred to the suggestion that the works should be transferred down the river to Barking as one which only a madman would make. The South Suburban Company had gone lower down the river; but the site chosen was in their own area. The Brentford Company could not do this unless they had three times their present capital.

Coming to the electric clauses, reference was made to the Ascot, Bishop's Stortford, and Farnham combined gas and electricity works, which had been sanctioned by Parliament.

Mr. BALFOUR BROWNE, in cross-examination, referred to the allegation of the promoters that the whole scheme of the Bill was to benefit the consumers. Evidently the Company were proposing to give the consumers a benefit they did not want, as they were all represented against the Bill. Witness said that the mere fact that some of the local authorities were opposing the Bill did not imply that all the gas consumers were opposed to it.

Mr. PAGE and Mr. JEEVES both put questions as to the supply of power gas. Witness doubted very much whether, in either Hammersmith or Twickenham, such a supply would ever be wanted. He would not, however, agree to cutting these two districts out of the Bill for this purpose.

Mr. TYLDESLEY JONES, for the Chiswick Corporation, dealt with the question of nuisance, particularly from the purifiers of a gas-works. Witness said that in modern purifiers revivification was done *in situ* in the purifier, and consequently no smell was created. It was true that in very few existing works was this method used, because of the expense of altering the pipes and valves. The Chiswick works, however, would be entirely new, and operated upon modern lines.

Mr. HONORATUS LLOYD suggested to the Committee that, having regard to the nature of the evidence which had been given, and would be given, with regard to the site, it would be a great assistance to justice if the Committee could arrange to see it.

Mr. BALFOUR BROWNE asked that the Committee should not inspect the site until they had heard the evidence against the Bill.

The CHAIRMAN said he had been thinking of this matter, and probably himself and some other members of the Committee would like to see the site. He would not pledge them, however, to do so, nor could he undertake to visit any other part of the district.

Mr. HONORATUS LLOYD, in answer to the CHAIRMAN, said that he proposed to call as witnesses Sir Corbet Woodall, Mr. H. E. Jones, Mr. A. Watney (Surveyor), and Mr. W. Cash (Accountant). He hoped to finish his case after one more day.

Mr. BALFOUR BROWNE said he had six or eight witnesses to call. There were three or four from Hammersmith and a few by other petitioners; and it was not likely that the proceedings could be finished before Thursday.

The Committee adjourned until yesterday (Monday).

LEGAL INTELLIGENCE.

ACTION AGAINST THE WELSBACH LIGHT COMPANY.

The case of *Ehrich and Graetz v. Welsbach Light Company*—a motion by plaintiffs to set aside the award of an Arbitrator dated Dec. 29—was mentioned on Monday of last week in a King's Bench Divisional Court, before Mr. Justice LUSH and Mr. Justice ATKIN.

Mr. COLAM, K.C., and Mr. ARTEMUS JONES were for the plaintiffs; Mr. COLEFAX, K.C., and Mr. CROOM JOHNSON for the defendants.

Mr. COLAM said he had been consulting with his learned friends on the other side, and also with the Solicitors; and he thought they were on the way to a settlement. But the principals were in Germany; and it was necessary to get their consent. He therefore asked that the case should stand over, to be mentioned again.

Mr. CROOM JOHNSON assented to this course.

HEAVY LOSS ON A MANTLE BUSINESS.

At the London Bankruptcy Court last Tuesday, the public examination was held of Herbert Samuel Sanguinetti, described as of No. 110, Jermyn Street, St. James', S.W. The statement of affairs filed by the debtor disclosed gross liabilities amounting to £29,518, of which £21,314 was expected to rank for dividend. The assets were estimated to produce £561; thus leaving a deficiency of £20,753.

In reply to questions put by the Official Receiver, the debtor stated that he commenced business as a financial agent in 1873, under the style of H. Lester. He had been interested in the formation of a number of companies. In 1907, he obtained an option to purchase the rights for Great Britain and the Colonies in a patent gas-mantle from the Cerofirm Gesellschaft, of Berlin. A sum of £1000 was paid for the option, which was provided by a friend who became a Director of the Company. He formed the British Cerofirm Company, with a capital of £100,000, to manufacture and sell the mantles. The public subscribed £35,000; and works were erected at Bromley. The German process proved a failure, as they could not make the mantles under it. Their chemist, however, managed to make a sample mantle under his own process. They could not obtain enough capital to work the thing; and the Company subsequently went into liquidation. The German Company received £17,000 in cash and £35,000 in shares in the English Company. The £17,000 was paid out of the £35,000 subscribed by the public. The debtor received £5000 in cash from the vendors, out of which he paid £3000 to other people who found the promotion money. In 1910, he was sued by the Liquidator of the Company for the return of the £5000, on the ground that the promoter's profit was not disclosed to a shareholder who had purchased 100 shares. An action was brought against him for the return of the £5000, with

interest; and judgment was given against him for £5907. Subsequently the Liquidator agreed to accept £3000 in full settlement of his claim, payable by instalments. He had managed to pay £350 on account, but was unable to keep up the instalments. He alleged his failure to have been caused through losses on the promotion of certain companies, depreciation in the value of securities, losses on the Stock Exchange, and interest for a number of years on borrowed money.

The examination was ordered to be closed.

A Difficult Case.

At the Woolwich County Court a month ago [*ante*, p. 374] a claim for compensation in respect of an accident which occurred in July, 1906, was brought by George Collard, of East Ham, against the Gas Light and Coke Company. The medical evidence was conflicting; and His Honour reserved judgment. On the case being called on for hearing again last Wednesday, an application was made with regard to the proposed appointment of a Medical Referee—a point which arose during the hearing of the case; and Counsel pointed out that his Honour had power to refer to the Medical Referee after hearing the evidence, if he considered it was entirely a medical question. His Honour said he asked for a Medical Referee, but was met with the objection that it was not allowed under the Act under which compensation was claimed. It was a matter in which he should have liked to have the opinion of the Medical Referee, as it was one of the most difficult cases he had had in the course of his long experience. The case was then further adjourned for the submission of the evidence to the Medical Referee.

Gas Worker's Loss of an Eye.

At the Wandsworth County Court, before Judge Harington, sitting with a Medical Referee, on Friday, Herbert A. Kent, labourer, applied for compensation under the Workmen's Compensation Act for the loss of an eye; the respondents being the Wandsworth, Wimbledon, and Epsom District Gas Company. Applicant stated that he was employed by the Company as a labourer. On Sept. 6, he was working by the side of a man who was cutting a piece of gas-piping, when an iron chip fell off, and struck him in the right eye. He was taken to hospital, and the chip was removed, and the eye taken out. He continued to attend the hospital until Dec. 20, and some time that month he was fitted with a glass eye. At present the eye gave him pain. He was paid compensation to Dec. 20, and then was offered his old job; but he did not take it, because he was not in a fit state to do the work. Mr. J. Petterell, of the Engineers' Department of the Company, said that he had an interview with Kent on Dec. 18. The interview had reference to offering the applicant work. Kent said that he wanted an agreement that he should be permanently employed at the work he had been at previously. Witness told him that they would be quite prepared to take him back, and find suitable work for him, but that the idea of giving him permanent employment for what was casual labour was out of the question. Witness told him they had received a certificate stating that he was fit for work, and that compensation would be stopped. Kent appeared to think that it would be somewhat risky to return to his own work, but suggested he should be given home fitters' work. He was told he should have an opportunity of showing his ability. It was agreed that he should return to work on Dec. 22, and that the time taken up in going to and from the hospital should be taken as time worked. He did not turn up; and witness had not seen him since. Dr. Brown, of St. Thomas's Hospital, said Kent ought to attend the hospital from time to time. If he could do this, he could go back to work, providing it was light work. Judge Harington, having consulted the Medical Referee, said he did not think any case had been made out for an alteration in the amount of compensation at the present time; and there would be an award of half wages.

"Stellorite" Steel Again.—At the Ryde County Court last Wednesday, Tom and John Heyman, with their partner Weinberg (who did not appear), trading as the Stellorite Company, of Paris, claimed from the Corporation of Ryde £16 18s. 8d. for goods alleged to have been sold and delivered to them. The Borough Surveyor (Mr. F. W. B. Waterworth) was a joint defendant in the action. The defence was that the order had been obtained by fraud. The case was similar to others which have been reported in the "JOURNAL"—viz., a small quantity of the material intended to be ordered, and a large quantity delivered. The order was given by the Borough Surveyor in the belief that he would have a piece of steel of the value of about £1 or £1 10s., by way of experiment—not £16 worth. The case was adjourned.

Bognor Gas Company.—Full statutory dividends are being paid by the Bognor Gas and Electricity Company; the net revenue of the half year being £3471, of which the expenditure left £1703. The supply of electricity commenced in November; and it is thought that it will be a profitable asset. The increased sale of gas amounted to 1 million cubic feet above the corresponding period of last year.

Public Lighting of Ilfracombe.—At the monthly meeting of the Ilfracombe District Council last Tuesday, the reports of several Committee meetings relating to the negotiations with the Ilfracombe Gas Company in regard to the public lighting of the town were read. After a conference with the Company's Manager (Mr. J. Armstrong), it was decided to ask them to provide 118 new lamps—24 to be on the Capstone Promenade. The Council offered to increase the term of the contract for public lighting by two years, making it for seven years, at £880 instead of £750 per annum. In reply the Company asked that the term should be ten years. Mr. Armstrong again met the Committee, and it was moved that the term be eight years. Mr. Armstrong explained that he would have to submit the matter to his Directors, and they would reply in due course. The reports were adopted. At a later stage of the meeting it was stated that an agreement had been come to, and the Clerk said he would bring up the contract to be sealed, when the terms which had been read in Committee would be read again.

MISCELLANEOUS NEWS.

MELBOURNE METROPOLITAN GAS COMPANY.

Half-Yearly Meeting on Jan. 28.

This Meeting (the 72nd) was held under the chairmanship of Mr. JOHN GRICE.

The SECRETARY (Mr. John Hinde) having read the notice convening the meeting, the report and accounts were taken as read.

The CHAIRMAN then said: Before dealing in detail with the balance-sheet, I will, as usual, bring under notice the progress achieved by the Company during the full year of 1913 by comparing the business of that year with other years. The sales of gas for the 12 months reached a total of 2,589,000,000 cubic feet, against 2,321,000,000 in the year 1912—an increase of 11¼ per cent. in the output. The outputs for the three years preceding 1912 were as follows: 1911, 2,101,000,000 cubic feet; 1910, 1,835,000,000; 1909, 1,694,000,000. The sales in 1913 were, therefore, nearly 53 per cent. in advance of those of four years ago. The number of meters standing fixed on Dec. 31 was:

	1913.	1912.	Increase.
Ordinary	107,872 ..	100,444 ..	7,428
Slots	24,432 ..	22,831 ..	1,601
Total increase for 12 months in the number of meters			9,029

This excess over 1912 was not so great as the increase shown in 1912 over the previous year; but there was a larger average consumption in 1913 than in 1912, which may be accepted as an indication of the greater number of purposes for which gas is coming into use in the homes of the people. The returns from the stove department for the year 1913 are a satisfactory indication of the activity which has characterized the work of the department. These show that the stoves in use on Dec. 31 last exceeded the number at the same date in 1912 by 10,418. The Company have sold on hire-purchase or right out to new consumers during the twelve months 10,617 cooking stoves. These sales are not so large as those in 1912, which was a record year; but it may, perhaps, be expedient to warn shareholders that even the number of houses in Melbourne requiring stoves has a limit. During the last five years—beginning with 1909 and ending with 1913—there has been a net increase of 45,162 in the number of stoves installed. During last year 3748 stove-users, who were previously renting their stoves from the Company, purchased them. Consequently the number of leased stoves showed a considerable diminution. Our lady stove instructors have visited 13,000 stove-users during the year, and assisted consumers to obtain the most effective and economical results from their stoves. These figures do not include the smaller class of other apparatus—such as breakfast cookers and boiling burners—of which we have disposed of a total number of 2271 in the year. The popularity of gas-cooking among our slot-meter consumers continues to grow; and on Dec. 31 last 18,137 stoves were in use, out of a total number of slot-meters standing fixed of 24,432—that is to say, three out of every four slot consumers were cooking by gas. The output of penny-in-the-slots being nearly 25,000, it is a seasonable time for stating the rapid progress made in this part of our business. At the end of 1905 we had 2150 in use, with a revenue for the year of £2591; in December, 1913, we had 24,432 installed, and had received for the year a revenue of £80,504.

GAS COOKING.

Gas for cooking has been substituted for other forms of fuel in a number of establishments in Melbourne, in which the respective managements, after careful inquiry as to cost, cleanliness, and convenience, have installed large gas ranges (supplied by the Company), some of which are capable of cooking for upwards of 250 persons at one time. These establishments include the Melbourne Club, the Australian Club, the Alfred Hospital, restaurants, private hospitals, and large boarding establishments. The newly-erected Commercial Travellers' Club, and some large private houses, have also arranged to do their cooking by gas.

HOT-WATER CIRCULATING APPARATUS.

For boarding-houses, private hospitals, hotels, residential flats, and private houses—in fact, anywhere where a regular supply of hot-water for baths and household purposes is important—the use of hot water circulators is being found to be especially suitable and economical, as it avoids the heat of a continuous large fire in the coal range; and the Company during the year supplied a number of houses with this apparatus. The system can be applied as an adjunct to, or independent of, any existing fuel range hot-water circulator. The size of the apparatus is determined by the storage capacity of water required to be heated and kept hot, which may be anything from, say, 10 to 50 gallons or more.

HIGH-PRESSURE LIGHTING.

We have for some time been devoting special attention to developing the use of gas under pressure in factories, laundries, and other similar establishments; and there is now on our list of consumers a large number of this class. In all, there are over sixty factories and other business premises where ironing, heating of trade apparatus, &c., are carried on with the pressure system. The economy and convenience of its adoption are becoming more appreciated daily. Then high-pressure lighting is a very successful competitor against electricity as an illuminant in the old country, either for street, shop, or factory lighting purposes. We have recently fitted up our show-rooms and main office on this system as an object-lesson. One of our leading drapers' establishments is now also being installed with high-pressure gas lighting; and this will, we feel sure, only be the forerunner of many other similar installations in the city and suburbs. The light, candle-power for candle-power, is not only much more economical than electricity, but is an absolutely steady and very brilliant one, showing the true colour of articles displayed. In addition to this, we have also recently fitted up at the Working Men's College complete separate installations for high-pressure lighting and heating, with the object of educating the students in the most up-to-date methods of

using gas for these purposes. The installations will be put into operation for the first time in the forthcoming session at the college.

GAS-FIRES, BATH-HEATERS, &c.

Our sales of bath-heaters reached the total of 758, against 273 for 1912; and of gas-fires we disposed of 1737, compared with 1056. We, however, look for still larger increases each year in these, and in our newly introduced wash-coppers, which save the expense of the old built-in laundry copper.

HALF-YEAR'S REPORT.

Referring now briefly to the figures contained in the balance-sheet for the past half year. The receipts from sales of gas were £276,725, as against £258,477 for the December half of 1912, representing an increase of £18,248. The receipts from sales of residuals produced £77,818, compared with £64,745. This is an exceptionally good return. On the expenditure side of the balance-sheet it will be seen that coal has cost £9303 in excess of the December half of 1912. This is accounted for by the larger quantity of coal carbonized during the half year, necessary to meet the increased output of gas, and to the higher rates of freight under the new contract in force for the full six months. As in some previous half years, a sum of £10,000 is included under the heading of "repairs and maintenance of works," which is an anticipatory provision towards the work of repairs in the form of renewal of works rendered necessary by the continued demands of our expanding output. The profits for the half year have been treated on the usual lines. A sum of £25,000 has been transferred to reserve fund account, and the sum of £5000 has been placed to the credit of meter renewal fund and to gas-stoves, &c., account respectively—both amounts being provisions for depreciation on these portions of the Company's property.

CARBONIZING PLANT AND NEW MAINS.

At our meeting last July it was stated that a contract had been let for the erection of a further installation of eleven beds of Dessau vertical retorts at South Melbourne. This work is now being proceeded with as rapidly as possible, in order that additional carbonizing plant may be available when the heavy demands of next winter for gas have to be met. The whole of the fifteen beds of vertical retorts erected at West Melbourne, a portion only of which was in operation when we last met, have been in constant use since the middle of August. It has been necessary to expend a large amount during the past half year in the extension of mains in all parts of our area of supply. The high-pressure main from the North Melbourne holder to the Company's works at Fitzroy has been completed; and this, together with the laying of some 18½ miles of ordinary mains and 80½ miles of services, has cost £27,792.

ISSUE OF SHARES AND DEBENTURES.

Resolutions giving the Directors power to issue new share and debenture capital will be submitted later on. The proposal is consequential on the heavy capital expenditure for purposes which have from time to time been approved. The necessity for such an issue will be quite apparent on reference to the balance-sheets for the four half years to Dec. 31 last. These show that the Company expended on works out of capital in 1912 £80,432, in 1913 £83,044—a total capital expenditure during the two years of £163,476.

RESIGNATION OF THE ENGINEER.

The shareholders, in common with the Directors, will regret that Mr. Hunt (whom I congratulate myself on having selected as Assistant-Engineer when in London in 1902) is severing his connection with the Company. He has, during his association with it, both as Assistant-Engineer and as Engineer, carried out the duties attaching to the office to the complete satisfaction of the Board. This is saying a great deal, as owing to the Gas Inquiry Board, when the Secretary and Mr. Hunt, as the principal executive and chief technical officer respectively of the Company, had to work-up all information required by Counsel, and were the principal witnesses on behalf of the Company, a great deal of work not regularly falling to the lot of an engineer was most excellently performed. Similar unusual work was done by him when conducting the case for your Company in the Arbitration and Conciliation Court—first with the assistance of Mr. Hinde, and afterwards by himself. He gained great *kudos* for the capacity and tact he showed in its management. Mr. Hunt is leaving us for his own benefit; and we can only wish him future success in life. It is satisfactory to report that Mr. Reeson, an engineer of very high standing in the gas profession, has accepted the appointment to the position thus vacated. Mr. Reeson has been for some years the Engineer of the Beckton works belonging to the Gas Light and Coke Company, which are the largest gas-works in the world, having a daily capacity of 80 million cubic feet of gas.

GAS PROGRESS IN GREAT BRITAIN.

Gas shareholders naturally remain more assured as to the stability of the industry in which their capital is invested when they know that that industry is doing exceptionally well elsewhere; and it will interest you, therefore, to learn from the following comparison of the progress of gas in Great Britain in the last thirty years. The figures are taken from the Board of Trade returns:—

Companies.

Year ending Dec. 31.	No. of Companies.	Share and Loan Capital Paid Up.	Gas Sold. Cubic Feet, Thousands.	No. of Consumers.
1882 . . .	352	£32,934,935	45,484,910	1,055,009
1911 . . .	520	92,989,680	119,497,425	3,906,528

Local Authorities (Municipal).

Year ending March 31.	No. of Authorities.	Loan Capital Paid Up.	Gas Sold. Cubic Feet, Thousands.	No. of Consumers.
1882 . . .	148	£17,326,183	21,129,034	916,962
1912 . . .	302	43,108,248	75,053,780	2,743,376

This is corroborative testimony to the general advance shown by the gas industry, and, as it is evident from the progress our figures disclose to-day that the Melbourne Company is no exception to the rule, gas shareholders should be able to look forward to the future with every confidence. I now move the adoption of the report and balance-sheet.

Mr. JAMES DYER seconded the motion. He thought the shareholders were to be congratulated on the excellent position of the Company and the splendid way it had been managed.

The motion was carried.

Mr. G. B. VASEY moved, and Mr. S. E. FIGGIS seconded: "That a dividend of 6s. 6d. per share be declared out of the profits for the half year ended Dec. 31, 1913."

The motion was adopted.

The CHAIRMAN, after explaining that the proposed issue was not really an increase in capital, but merely an issue of part of the unissued capital, moved: "That the Directors are hereby authorized to increase the capital of the Company by the creation of 10,000 additional new shares of £5 each. That such shares shall be disposed of in accordance with the provisions of the Company's Act of Incorporation; and the bonus or premium arising in respect of such shares shall be applied to such object or objects as, in the opinion of the Directors, may be most beneficial to the Company."

Mr. E. PHILLIPS, who seconded the motion, said that the change was necessary owing to the progress of the Company.

Other formal business—including the re-election of the retiring Directors—was transacted, and the proceedings terminated.

A STRIKE AT WARRINGTON.

Messrs. Fletcher, Russell, and Co.'s Works Closed-Down.

A strike at the Warrington works of Messrs. Fletcher, Russell, and Co., on the vexed point of "recognition," has resulted in the closing-down of the works by the firm for an indefinite period. Over a thousand employees are stated to be affected by the dispute, into which wages and working conditions do not enter at all. The men claim the right to approach the firm by deputation when they have any grievances to bring forward; but the firm have replied to the effect that any workman having a complaint to make must notify the foreman of his particular "shop," who will in turn bring it before the manager. As a matter of fact, the attitude of the firm towards trades unionism was clearly defined in a notice posted up at the works two or three months ago: "The Company wish their employees to know that they do not place any obstacle in the way of their men joining any trade union; but if any of their employees refuse to join a union, they will not be dismissed for such a refusal, as the Company hold quite an impartial view with reference to trade unions. Any man having a complaint to make as to anything regarding his employment, can, without fear, mention the matter first to his foreman, who will then report to the manager, when such complaint will receive attention."

When the Town Council met on Tuesday evening, the Mayor (Mr. Peter Peacock) announced his willingness to act as mediator, if both parties to the dispute cared to avail themselves of his services; and on his behalf the Town Clerk wrote to the firm and to the men's Joint Committee to the same effect. In reply, the Directors expressed the opinion that all overtures should come from the workmen, who had struck for unsatisfactory reasons. The men's answer was understood to be to the effect that if they could arrange a conference with the firm, they would be pleased immediately to avail themselves of his Worship's offer.

The strike began yesterday (Monday) week, when 900 employees absented themselves; the unions involved being the Stove Grate Workers, the Gas Workers, the Central Ironfounders, the Sheet Metal Workers, and the United Pattern Makers. The heavy expense of running the works for the small proportion of men who remained then compelled the firm to close-down entirely, as already stated.

Gas-Works Inquiry at Wokingham.

Mr. F. O. Stanford, a Local Government Board Inspector, has held an inquiry at Wokingham in connection with an application made by the Town Council for a Provisional Order to acquire additional land and other powers for their gas-works undertaking. The Town Clerk informed the Inspector that the outstanding loans amounted to £19,940, of which £5670 was on account of existing gas-works. The present accommodation at the gas-works was quite inadequate; and it was essential that more land should be acquired. At present, the total capacity of the plant was 120,000 cubic feet per day; while the actual consumption was sometimes as much as 117,000 feet. Should there be an accident to any of the retorts, the Corporation would be in a most embarrassing position. The output for the present year was estimated at 26 million cubic feet. The only opposition came from the Yorktown Gas Company, who pointed out that they had power to supply right up to the boundaries of the borough.

Brisbane Gas Company.—Work in hand for the Brisbane Gas Company includes an installation of vertical retorts and the extension of the mains to supply new districts. The accounts for the half year ended Dec. 31 show a net amount to the credit of the profit and loss account (inclusive of the balance brought forward from the previous half year) of £20,344. A dividend of 6 per cent. will absorb £13,440, and income-tax thereon £672—leaving £6232 to be carried forward.

Gaslight and Coke Company's New Standard.—At the meeting of the Court of Common Council of the City of London last Thursday, the County Purposes Committee presented a report recommending, agreeably to Standing Orders, that the Committee be authorized to oppose the Gaslight and Coke Company's Bill in Parliament, and, if necessary, to retain Counsel and obtain evidence, and take such other steps as may be deemed advisable. The report was carried *nem con.*

COMPANIES' REPORTS AND MEETINGS.

SOME OF THE CHIEF ITEMS OF NOTE.

Aberystwyth Gas Company.—A prosperous half-year's business was set forth by the Directors of the Company in the report which was submitted at the recent meeting. A reduction of 3d. per 1000 cubic feet was made at the commencement of 1913; but owing to the increased demand, the income from gas was greater than before. This improved demand necessitated an extension of mains, which was largely effected within the half year; and the cost was included in the present accounts. The lowering of the price entitled the shareholders to improved dividends—on the original shares at the rate of 5s. per cent. per annum for each 1d., and on the new shares at the rate of 3s. 6d. for each 1d. These additions were chargeable upon the revenue for two half years; and thus the Directors were able to recommend payments at the rate of 12¾ per cent. per annum, *plus* the addition stated, on the original shares; £8 18s. 6d. per cent. per annum, also *plus* the addition due, on the new shares; 5 per cent. per annum on the preference shares; and 4½ per cent. per annum on the debenture bonds—all less income-tax.

Beaufort and District Gas Company.—The annual meeting of this Company (of which Mr. W. P. Gibbons, J.P., is Chairman) was held last Tuesday, when the report and balance-sheet for the twelve months ended Dec. 31 were adopted. The report stated that the profit for the year amounted to £326. This, added to the amount brought forward (£29), gave a total of £355. After deducting a dividend of 2¾ per cent. already paid upon the preference shares, there remained a balance of £326 to be dealt with. The Directors recommended that a dividend of 2¾ per cent. be paid on the preference capital (less income-tax), making 5½ per cent. for the year; that a dividend at the rate of 5½ per cent. per annum be paid on the ordinary capital (less income-tax); and that (after payment of Directors' fees, &c.) the balance be carried forward. The sales of gas (at 5,094,400 cubic feet) represented an increase of nearly 30 per cent. over 1912. The loss from leakage was considerable, owing in large measure to drainage operations in the district. For the present year, the gas consumption continues to show a satisfactory increase.

Blyth Gas Company.—The total income of the Company for the past year, at £23,839, was £2363 up, in spite of the fact that the price of gas was less than it was in the first half of the previous year. On the other hand, the expenditure was £3205 more. There was a balance of profit on the year's working of £5890. The quantity of coal carbonized was 12,400 tons, yielding 149 million cubic feet of gas, or equal to 12,013 feet per ton. At the meeting, the Chairman (Mr. R. G. Dobson) stated that, in consequence of the growing demand, the manufacturing plant is now working up to its full capacity; and extensive additions are in contemplation. The new Act was Royal Assented last August; and at the beginning of the following month the Company took over the works, plant, consumers, &c., of the Bedlington Company. A dividend at the rate of 3¾ per cent. (less income-tax) was declared. At an extraordinary general meeting which followed, the Directors were empowered to sell by public auction or tender, as they might think proper, 5 per cent. ordinary or debenture stock amounting to £15,000, as additional capital.

Brixham Gas Company.—The report of the Directors submitted at the annual meeting of the Company showed a profit of £1985 on the gas department, and £234 on the electricity department. An interim dividend to June 30—viz., at the rate of 5 per cent. on the preference, 10 per cent. on the original ordinary, and 7 per cent. on the additional ordinary shares—was paid; and after deducting interest on loans, a balance of £831 was carried forward. As the costs in the action in which Mr. S. C. Edwards obtained an injunction against the Company for alleged nuisance in respect of vibration from an engine were payable by the Company, no further dividend was recommended for the year.

Chelmsford Gas Company.—It was stated in the annual report of the Company that there had been an increase of 10·9 per cent. in the sales of gas. The profit and loss account showed an amount available of £5416; and the Directors recommended dividends of 6 per cent. on the original share capital and 4 per cent. on the additional and new share capital—making, with the interim dividend paid in September, 10 and 7 per cent. for the year, less income-tax. As the works were scarcely large enough to cope with the present demand for gas, and there was no room for expansion on the present site, the Directors had decided that it was necessary to procure more land with a view to reconstructing and enlarging the manufacturing plant, and increasing the storage capacity. They had therefore entered into provisional agreements for the purchase of land adjoining the works, and having a wharf on the canal, which would enable coal to be more readily and economically transferred from the barges to the works. In order to carry out these extensions, they were introducing a Bill in the present session of Parliament.

Cork Gas Consumers' Company.—The ninetieth ordinary general meeting of the Company was held last Friday week—Mr. Geo. Lynch presiding. The report showed that, after placing £150 to the insurance fund and £1297 to the depreciation fund, the balance of profit and loss stood at £5507. Out of this, it was proposed to pay a dividend of 8 per cent. per annum. The Chairman said it was a strange fact that, notwithstanding the severe competition with which they had had to contend, they were selling more gas than before the electric light was introduced into Cork. The utility, economy, and comfort of gas was becoming more and more widely recognized among householders; and the general demand for gas for lighting, engines, &c., continued satisfactory, as was evident from the fact that the number of meters in use was over 300 in excess of last year. As to a balance of unpaid dividends, they had decided that the best course was to pay them off at the rate of 1 per cent. per annum, along with the ordinary dividends.

Dover Gas Company.—The profits of this Company for the six months ended Dec. 31 last were, as in the case of other gas companies, materially affected by the high price of coal. The balance carried to the profit and loss account was £4072; and the net profit was £3444. This was insufficient by £86 for paying the full statutary dividend, which the Directors recommended, so the amount named had to be drawn from the surplus profit balance, leaving £7657 to the credit of the current half year. The Chairman (Mr. Willsher Mannering), in moving the adoption of the report, said the Company had had to pay the highest price for coal for the current half year, and in all probability it would be necessary to draw further from the surplus profits to meet the dividend. There were, however, indications that the price was falling. He added that all the officers, staff, and employees had again rendered very able and valued assistance, and had done their best in the interests of the Company during a period of no little anxiety. The report having been adopted, Mr. W. R. Herring said he thought the Company were to be congratulated on the results of their working, after the trying period which had been passed through. He referred to the fact that the occasion was the eightieth consecutive half year that Mr. Mannering had attended the Company's meetings. He thought that this was a unique record, and that the prosperity of the undertaking was in great measure due to the Chairman.

Draycott, Shirebrook, and Tuxford Gas Companies.—Three annual meetings presided over by Mr. J. N. Derbyshire were held in Nottingham last week. The Draycott Company reported sales of gas for 1913 amounting to 52,000,000 cubic feet, being an increase of 4,500,000 feet over 1912. The trading profit was £3217, enabling the Directors to pay the usual dividends of 5 per cent. on the preference shares and 5 per cent. on the ordinary consolidated stock, and to write-off £500 further on account of parliamentary costs (leaving a balance of £185 to be carried forward to next year). The Shirebrook Company's sales of gas for the year were 36,000,000 cubic feet, or an increase of 4,500,000 feet. The trading profit was £3259, being an increase of £132. The Directors recommended the usual dividend of 10 per cent for the year, carrying forward a balance of £448. At Tuxford, the sales of gas were reported to have been the highest on record; and the working profit showed an increase.

Elland-cum-Greetland Gas Company.—When moving the adoption of the report and accounts—providing for a dividend at the rate of 7½ per cent.—at the annual meeting of the Company, the Chairman (Rev. G. E. Aspinall) said they had sold 4·19 per cent. more gas; and the revenue from all sources showed an increase of £1034. Though over 5¼ million cubic feet more gas had been sold, 696 tons less coal were used. The total sales of gas amounted to 132 million cubic feet. He summarized the net results of the year's working as follows: (1) Statutory dividends and interest have been earned; (2) the reserve fund has been increased by £204; (3) the carried forward balance has been increased by £1034; (4) the suspense account on public lamps has been reduced by £15. The reserve fund now stands at £7026, and the insurance fund at £5099. The Board have under consideration a proposal to erect an installation of vertical retorts in the building now occupied by horizontals. If this scheme should be adopted, it will necessitate the issue of further capital.

Farnworth and Kearsley Gas Company.—This Company held their half-yearly meeting last Thursday week—Alderman James Fletcher, J.P., presiding. In moving the adoption of the report, the Chairman said it was the first year they had had to report a decrease (quite a small one) in the sale of gas—probably due to the mild weather. In September the price of gas was reduced 2d. per 1000 cubic feet; and this had brought down the profits by £750. Enough profit, however, had been made to meet the full dividends and leave a margin. The District Council of Farnworth and Kearsley had proposed purchasing the Company; but so far nothing had been done. The Directors had asked Mr. William Newbigging to prepare a report on the works; and in it he said that the retort-house and machinery would have to be reconstructed if they wanted to modernize them. The Directors took the opportunity of consulting the shareholders, as they were not eager to enter into such a scheme as this without doing so. There was no doubt it was necessary to have the alterations made, so as to keep the price of gas down, and also to meet the higher wages that were now asked. Labour-saving machinery would need to be introduced; and this would require them to pay higher wages. It would take two years to do the projected work. The meeting agreed, in regard to the new scheme, that everything be left to the discretion of the Directors.

Haywards Heath Gas Company.—Mr. A. H. Cæsar was voted to the chair at the ordinary general meeting of the Company last Wednesday. The report and balance-sheet for the half year ended Dec. 31 were proposed for adoption by the Chairman, who said the Company's position was in many ways highly satisfactory. There had been supplied 24 million cubic feet of gas, which was about 1½ million feet increase on last year's figures. Dividends were recommended at the rate of 8¾ per cent. upon the original capital (making 13¾ per cent. for the year), and £6 2s. 6d. per cent. upon the additional capital (making £9 12s. 6d. per cent. for the year), which would leave £2980 to be carried forward. Referring to the Balcombe Petrol Gas Company's application for a Provisional Order, the Chairman said this would be considered, he was informed, in about a month's time. The Haywards Heath Gas Company would oppose the granting of the Order. There were some novel points to be considered by the Board of Trade; and their decision would have to be given before the Haywards Heath Company's Bill could go further forward in Parliament.

Hornsea (Yorks) Gas Company.—The fiftieth annual meeting of this Company was held last Saturday week—Mr. Thomas Johnson (Chairman and Managing-Director) presiding. It was reported that the works and plant were in good repair and condition. The consumption

had considerably increased, and additional storage would shortly have to be provided at the works—necessitating increased capital expenditure for which a special resolution was submitted. This being the Jubilee year of the Company, the Directors decided to mark the event by reducing the price of gas from 3s. 9d. to 3s. 4d. per 1000 cubic feet after the June quarter meter-readings.

Ilford Gas Company.—In the report which was adopted at the half-yearly meeting of the Company on Monday of last week, the Directors stated that the increase in the sale of gas for the six months to Dec. 31 amounted to 4·78 per cent. as compared with the corresponding period of the previous year; while the number of consumers had increased to 15,165. After providing for interest charges, there was a balance available of £30,497, out of which the Directors recommended dividends for the half year at the rate of 7⅝ per cent. per annum on the "A" and "C" stocks, and 6½ per cent. per annum on the "B" stock (less income-tax), leaving £23,488 to be carried forward. The death was announced with regret of Mr. H. W. Ashmole, who was for over 35 years connected with the Company as Secretary and Director, and to whom the proprietors voted an allowance on his retirement in 1911. The Chairman (Mr. William Ashmole) remarked that on the whole the Company had done exceedingly well; and the balance-sheet showed a very gratifying result of the half-year's working. The amount of gas sold in the six months was 223,826,000 cubic feet, or 10,230,000 feet more than in the corresponding period. The Company had escaped the high price of coal and oil over a considerable period through the advantageous contracts they had running. The price of gas had been reduced by 2d. per 1000 cubic feet as from the Christmas quarter; and this reduction, in the face of the present high price of raw material, was an indication of their sound financial position. The capital of the Company, in relation to the gas manufactured, now stood at a normal figure. New purifiers were being put down; and other extensions and alterations were required, which would receive the consideration of the Board. There were a number of estates being developed at the present time; and an increase of business in consequence was anticipated. At the end of June, 1913, the number of cookers on hire was 11,363; and at the end of December, 11,508. The number of gas-fires on hire at the end of June was 520; and at the end of December, 709. These figures only related to cookers and gas-fires actually on hire, and did not include the considerable number that had been sold or placed on hire-purchase. They had also done a considerable business in geysers, water-circulators, gas-coppers, and gas-irons. A system of hiring-out gas-lamps for shop lighting had been put in force; and it was felt that this filled a very useful purpose in enabling the Company to retain the shop lighting against the keen competition with electricity. They had at present four different makes of three-light inverted gas-lamps on their hiring-list; and these were fixed free and maintained at the small charge of 5s. per quarter—the consumer paying for running the service to the lamp in the first instance, and, of course, for the gas consumed. In 1903, the amount of gas made was 228,954,000 cubic feet; in 1908, 368,524,000 feet; and in 1913, 466,564,000 feet. Taking these figures, it would be found that last year's make showed an increase of 104·21 per cent. over 1903, and of 26·61 per cent. over 1908. It must be very gratifying to the stockholders to know that this increase had been met, and the works kept in first-class condition, notwithstanding the fact that the capital per million cubic feet sold had continually been on the decrease. As to the late Secretary, during a period of great stress and strain, and the litigation consequent upon the floods of June, 1903, it was greatly owing to his energy and ability that the Company emerged comparatively unscathed from a very critical position; and the Board sincerely regretted that, his health having given way, he was not spared longer to enjoy a well-earned retirement.

Lea Bridge District Gas Company.—The increased quantity of gas sold by the Company during the half year ended Dec. 31, as compared with the corresponding period of 1912, was 15,148,400 cubic feet, which was equal to 7·37 per cent. As shown by the accounts presented at the half-yearly meeting last week, the amount available for dividend (including the sum of £5524 brought forward) was £12,730; and from this the Directors recommended the payment of dividends at the rates of 5 per cent. per annum on the preference stock and 6½ per cent. per annum on the consolidated ordinary stock (both less income-tax). After carrying £707 to the credit of the reserve fund, there would be left a sum of £5542 to be carried to the next accounts.

Newark Gas Company.—The half-yearly meeting was held last week, and was presided over by Mr. T. Bradley, J.P., who said that the balance-sheet showed a satisfactory half-year's working, notwithstanding the heavy cost of coal. Residuals had not maintained their value; and the price of gas had been reduced to 2s. 5d. per 1000 cubic feet. The Company had installed regenerative settings (Brooke's patent); and no doubt the yield of gas would be increased.

Reading Gas Company.—A summary of the contents of the report of the Directors was given in the "JOURNAL" for the 17th ult. [p. 454]. At the recent annual meeting, Mr. J. Okey Taylor drew attention to the facts set forth in the report, and remarked that the Company, notwithstanding the difficulties they had had to contend with during the past half year, were in a strong position; and they looked forward with every confidence to the future. He referred to the increase for the year of 5·21 per cent. in the consumption of gas, the reduction in price on July 1 last to 2s. 3d. per 1000 cubic feet, and the ten-year contract secured for the lighting of the borough. On the personal side, he remarked that their esteemed Deputy-Chairman, Mr. H. B. Blandy, had recently completed fifty years' service as a Director of the Company; and during the last few months the Directors had persuaded him to have a photograph taken of himself, which had been framed and placed in the Board-room. Mr. Blandy was an example of what a good citizen should be. He had held numerous public offices; and he could say that, without exception, Mr. Blandy enjoyed the unanimous esteem of his fellow townsmen. As a Director of the Company, his advice had been invaluable; and he was sure he was voicing the feelings of all in saying they trusted Mr. Blandy would long be spared to them. Responding to a vote of thanks, the Engineer and Manager (Mr. D. H. Helps) said that since 1903 the price of gas had been reduced from 3s. to 2s. 3d. per 1000 cubic feet—a reduction which meant a saving of over £25,000 to the consumers of gas in Reading. He could not speak too highly of the loyal and valuable work of those engaged under his control. With regard to coke, he thought the shareholders might help to educate the public in the uses of this material.

Sevenoaks Water Company.—Extensive new works, in the shape of buildings and plant, at Kemsing, have been completed by the Sevenoaks Water Company, and are now in full working order. For some years past, these works have been the subject of very careful consideration on the part of those responsible for them; and there has been expended a large amount of capital, in connection with new trunk mains and reservoirs, as well as on the buildings and machinery. It was stated by the Chairman (Mr. Sydney Thompson), at the half-yearly meeting, that the result is entirely satisfactory; and a reward for the expenditure in the future is hoped for, though it has recently meant decreased dividend. The income for the past six months showed an increase and the expenditure a decrease; and the dividends were maintained at the rate of 9 per cent. per annum on the consolidated stock, £6 6s. per cent. on the ordinary share capital, and 4 per cent. on the preference shares.

South Hants Water Company.—The annual meeting of this Company was held last Friday week at Southampton. The Directors' report stated that the revenue was £33,525 10s. 1d.; while the expenditure allowed £19,098 to be carried to the profit and loss account. The whole balance in the latter was thus brought up to £12,023, after paying the interim dividend of £7044. Full dividends were recommended, with the transference of £986 to the back-dividend fund, and £693 to the depreciation and contingency account—the amount carried forward being £3241. It was reported that the Bishops Waltham undertaking had been transferred, and that the additions to the rent roll had thus been 556. A distribution of back-dividends was proposed at the rate of 2s. per share on the maximum 10 per cent. stock, and of 1s. 4⅘d. on the maximum 7 per cent. stock.

Waltham Abbey and Cheshunt Gas Company.—Last Friday week, the annual meeting of this Company was held under the chairmanship of Mr. Alfred Kitt. The profit reported for the year was £5078; allowing 8½ and 6½ per cent. to be paid on the several classes of stocks and shares. In moving the adoption of the report, the Chairman said its most remarkable feature was the reduction of the capital, which now stood at £868 per million cubic feet of gas sold. This was astonishing, because at the same time there had been an increase of gas sold. Their Manager's (Mr. W. B. Randall's) working results were astounding; the large yield of gas per ton and the gas sold beating all previous records. The gas made reached 105,229,000 cubic feet for the past year, and the amount sold 97,047,000 cubic feet; the unaccounted-for gas being only 6·74 per cent. With other companies they had experienced the difficulties arising from the increased cost of coal, depression in the price of residuals, difficulty of obtaining supplies, and labour unrest generally. Mr. Randall had got over these difficulties; and there could be no doubt of success in the future. Mr. Henry Woodall moved the payment of the dividends recommended. The statistics submitted that day were, he considered, highly complimentary to the Company, and especially to their Engineer. They had every reason to congratulate themselves, because they stood first in the country as the largest producers of gas per ton of coal carbonized. There was no single company using vertical retorts which yielded so large a quantity of gas per ton as they had. The reduction of the capital was a remarkable feature; and 8d. now paid the same dividend that 12d. did seven years ago. The unaccounted-for gas was about 6¾ per cent.; and they had their leakage down as low as 4 per cent. The explanation was that whereas gas used to be sold for lighting purposes only, it was now largely used for cooking purposes in addition. He did not know the meter which was reliable for passing gas at an excessive rate; and his experience was, after testing many meters of late years, that meters working three times their normal rate were losing from 5 to 6 per cent. The leakages they found in gas companies in the country were mainly due to overworked meters. Mr. F. R. Smith proposed the re-election of Mr. James Randall as one of the Auditors. In responding, Mr. Randall moved a vote of thanks to the Chairman and Directors for their continued attention to the business of the Company, also to the Engineer and Secretary, the staff, and the employees of all grades—noting the good feeling existing between employers and employed.

Watford Gas Company.—At the shareholders' meeting last Thursday week, the Directors reported that the new gasholder is practically completed, and will shortly be brought into use. The output of gas, especially during the winter months, has increased of late years so rapidly as to make this period of the year a somewhat anxious one for the Directors. But, with the new holder in action, the storage capacity at the Company's disposal will be quite sufficient to meet the demand for some years to come. The revenue account shows a profit of £4960; and the profit and loss account a balance of £8032. The Chairman (Mr. E. J. Slinn) said that last half year, on capital account, they had expended £2736, the greater part of which had gone towards the erection of the holder which was "such an object of beauty" in the High Street, and would certainly be an object of utility to the Company, for it would make for more economical and profitable working. Their sale of stock in October produced premiums amounting to £480 odd, which was a little over 10 per cent. on the nominal value of the stock. Considering that something like £8000 stock had been sold in the half year, this was a very good price. On the expenditure side there had been an increase of nearly £2000 on coal and oil. They reduced the price of gas to 2s. 6d. in 1909; and since then coal had risen no less than 5s. a ton. But they rather prided themselves on the fact that they had not even considered the possibility of increasing the price of gas to the consumers. The co-partnership scheme continued to give satisfaction, and had realized their hopes for its successful

working. There was a very satisfactory increase of £700 in the sale of residual products, which had gone a long way to pay the increased coal bill. They had been fortunate in their coal; and there was some reason to hope that the present high price would not continue. Some of the London companies were buying coal from abroad. Whether this was right or wrong, he would not stop to say; but at any rate it showed that they could import coal from Germany and Holland, and get it into the Thames at a cheaper rate than they could get it from the North of England. After the report and accounts had been adopted, and the full statutory dividends declared, the Chairman moved: "That an honorarium of 300 guineas be granted to Mr. F. H. Jones, one of the Directors of the Company, for special services in connection with the Company's works and plant." He said that the Board had had the great advantage of Mr. Jones's knowledge and experience, for which they would have had to pay a handsome fee if they had got it in any other way. Since 1909 they had expended nearly £40,000 in capital; and the designing of all this work had fallen to Mr. Jones. An engineer's charge would have been £2000. As it was they had only paid £500 for drawings and out-of-pocket expenses. The only remuneration that Mr. Jones had got had been out of the Directors' fees; and the Board considered that the Company ought to show its appreciation of his services. The resolution was carried unanimously; and, when acknowledging this practical way of recognizing his efforts for the Company, Mr. Jones made a few comparisons of their last half-year's working with that of seven London companies. Only one of the seven made more gas than they did at Watford. No company had more gas per gallon of oil; not one of the seven had such a small leakage as they had at Watford; only one company had sold more coke for every ton of coal; and Watford had made more sulphate of ammonia per ton of coal than any of the companies. This was, he contended, a very satisfactory result for what his fellow Directors and he had done with the skilful co-operation of the staff.

Weymouth Gas Company.—On the 26th ult. this Company held a half-yearly meeting for the purpose of passing the report of the Directors and the accounts for the second six months of 1913. In moving the adoption of the report, the Chairman (Mr. J. G. Rowe) mentioned that twelve months ago they reported a record increase of over 10 per cent. in the sale of gas for the second half of the year 1912; and now, although the weather in the closing months of the past year was anything but wintry, the quantity of gas sent out in the latter half of 1913 not only equalled that of 1912, but actually exceeded it by 1·13 per cent. The other prominent features in the accounts were the increased cost of coal and the decreased value of coke and ammonia. So far as the cost per ton of coal was concerned, they had to go back to the "early seventies" to find it at a higher figure. That was the period when what was known as the coal famine was experienced, and so abnormally high in price was coal then that it was necessary for the Company to go to Parliament to obtain special powers to enable them to raise the price of gas 9d. above the maximum authorized price. This special concession was granted to continue in force for two years; and the price of gas was raised to 5s. 3d. per 1000 cubic feet. Fortunately they had been able to pull through the recent coal crisis without increasing the price of gas, although the difference in the cost of coal, after allowing for the residuals, compared with two years ago, meant an increase in the cost price of gas of 4¼d. per 1000 cubic feet. This money, which might have been given to the consumers in the form of a reduction in the price of gas, had had to be paid away to those owning coal fields. In the report it was stated that the Directors had presented a petition to Parliament against the Weymouth and Melcombe Regis Corporation Bill, which is now being promoted. This, the Chairman explained, has been done not in any spirit of antagonism towards the Corporation, but simply for protecting the interests of the Company. A vote of thanks was passed to the Engineer and Manager, the Secretary, and the other members of the staff for the efficient discharge of their duties. Mr. D. F. Colson and Mr. E. Y. Wood both returned thanks for this renewed vote of confidence and for the appreciation shown for the services of the staff.

Winchester Gas and Water Company.—At the half-yearly meeting of the Company, the Directors' report submitted stated that the working had been successful; the revenue balance being £9110. The dividends recommended were 4 per cent. per annum on the preference stock, and at the rate of 4¼ per cent. per annum on the consolidated ordinary stock (less income-tax). The report was adopted; and a vote of sympathy was passed with the family of the late Mr. C. S. Wooldridge, who had been Secretary for upwards of forty years. Mr. H. C. Head was appointed Secretary as well as Engineer, at an additional salary of £100 per annum.

Worthing Gas Company.—Dealing with the past half-year's accounts, the Chairman (Mr. H. H. Gardner), at the meeting of shareholders, said the balance to the credit of the revenue account was £5673, compared with £6060 at the corresponding date of the previous year. In the profit and loss account, the amount brought forward from June 30 was £21,844; and the balance now standing to the credit of the account was £23,487. Having, as he believed, provided amply for securing to their consumers the use of gas at its best, they would hope for such steady progress as would enable the Board at an early date to consider the question of a reduction in price. The work of erecting a new holder was proceeding; and only those conversant with the business could thoroughly appreciate the anxiety to the Engineer and Manager (Mr. W. A. Walker) of sending out day after day a quantity of gas equal to nearly double the storage capacity available. It was pointed out that a system of canvassing and burner maintenance had been inaugurated which it was hoped would add materially to the business of the Company, and to a greater appreciation of their commodity. A dividend of 5¼ per cent. was declared. Responding to a vote of thanks, Mr. Walker said his own services and those of the Secretary (Mr. W. F. Verrall) dated back about thirty years; and as showing the development that had taken place in this period, he stated that, whereas the output of gas in the first year that he had the pleasure of serving the Company was only 39 million cubic feet, it was now upwards of 200 million feet a year.

HARROW AND STANMORE GAS COMPANY.

Effects of the National Gas Exhibition.

The Ordinary Half-Yearly Meeting of this Company was held on Monday of last week, at the Holborn Restaurant, W.C.—Dr. J. W. Lee Glaisher, F.R.S. (the Vice-Chairman), presiding.

The Secretary and Engineer (Mr. J. L. Chapman) read the notice convening the meeting; and the report of the Directors and the statement of accounts for the six months to Dec. 31 were taken as read.

The Chairman, on rising, referred first of all with regret to the fact that indisposition prevented Mr. A. H. Baynes from being present and presiding over the meeting. Proceeding to move the adoption of the report and accounts, he said it was with considerable misgiving that the Directors looked forward to the half year just ended. They had given notice to reduce the price of gas before the extent of the rise in the price of coal was known; so that they had to face both the reduction in the charge for gas, equal to about £1250, and the rise in the price of coal amounting to the same sum. Beyond this, most unexpectedly, the value of coke had a sudden fall, owing to the large accumulation of stocks. This drop was due to the large companies being unwilling to make their usual proportion of carburetted water gas, because of the very great rise in the price of oil. But, notwithstanding all these serious difficulties, the Directors were well satisfied, and he was sure the proprietors would be, with the results of the half-year's working. The dividend had been fully earned; and at the same time the remaining portion of the parliamentary expenses incurred for the Company's Act obtained in the last session (£478) had been charged to revenue. The Directors had also thought it wise to place to profit and loss account the stamp duty payable on the conversion of the old and the creation of the new capital under the Act, amounting to £802. The sum carried forward, after the payment of the dividends for the half year, would be £5395; and the reserve fund (to which £531 had been added from the profit and loss account) now amounted to £5803. The proprietors would notice a new amount of £72 charge in the profit and loss account for interest on the reserve fund now being employed in the general working of the Company. If this sum had been invested, the interest would have gone to the credit of the reserve fund account; and so the Directors thought it right, as it saved interest at the bank, that the amount should be credited to this account. All new services laid had been charged to revenue, including those required for the district of Northolt. In the report it was stated that the Directors had during the past half year laid mains through a portion of their district—the parish of Northolt—where gas has not heretofore been supplied. This accounted for the much larger amount under this item than in the corresponding half of the previous year. The influx of business for heating stoves and radiators was so large—due to the effect of the Gas Exhibition last October—that it was necessary to place the outlays to a suspense account. Heretofore, they had been debited to the revenue account direct. The Board were pleased to be able to report that the capital charges per 1000 cubic feet of gas sold had again fallen—even taking into account the large expenditure needed to pay for the extension of the mains throughout the parish of Northolt. This district was at present little built over; but there was every prospect now of considerable development there. The Company had already about fifty consumers in the parish. There had been quite satisfactory additions to the number of the ordinary and prepayment consumers; the gain for the half year being 240 of the former and 260 of the latter. The works and mains had been well maintained; and the amount written off for depreciation had been fully up to the average. The Directors felt that they might again congratulate the proprietors upon excellent results in the last half year—obtained under very difficult and adverse circumstances.

Mr. A. F. Phillips seconded the motion; and it was carried unanimously without discussion.

On the proposition of the Chairman, seconded by Mr. Samuel Cutler, dividends were declared for the six months to Dec. 31 at the rate of 11 per cent. per annum on the original "A" capital, £7 14s. per cent. per annum on the additional "C" capital, and 7 per cent. per annum on the additional "B" capital and guaranteed shares—all less income-tax.

Thereafter the retiring Directors (Mr. A. F. Phillips and Mr. Samuel Cutler) were re-elected, on the proposition of the Chairman, seconded by Mr. F. J. Bancroft; and the retiring Auditor (Mr. C. E. Goddard, M.D.) was also re-appointed, on the motion of Mr. J. E. Lilley, seconded by Mr. E. W. Drew.

Mr. Phillips, in proposing a vote of thanks to the Engineer and the staff under him for the work done during the half year, remarked that the accounts just passed were sufficient indication that the work had been well done. Mr. Chapman was to be congratulated on the results achieved. The business of a gas company was now very largely concerned with the distribution department; and Mr. Chapman and his staff used their best endeavours to discover what the consumer required and to satisfy his needs. This was really the only way in which a gas business could be developed to-day.

Mr. J. Cash seconded, and remarked that the substantial increases in consumption entailed constant increases in productive power and mains; and this was kept in mind by Mr. Chapman, who was to be congratulated upon what he had achieved under the unfavourable conditions of the past half year.

The resolution was supported by Mr. Bancroft, and heartily passed.

Mr. Chapman, in response, said that, like the Directors and shareholders, he was very pleased with the condition of affairs at Harrow. It had been a time of anxiety. To reduce the price of gas 2d. per 1000 cubic feet, and then have a rise of 2s. 6d. per ton in the cost of coal, did look uncomfortable; but when the balance-sheet was made up, everything came out better than could at one time have been reasonably expected.

The Chairman and Directors were thanked for their services, on the proposition of Mr. Lilley, seconded by Mr. A. W. Oke.

The proceedings then terminated.

LIVERPOOL PUBLIC LIGHTING.

The City Lighting Engineer's Report.

There has just been issued, by order of the Lighting Committee of the Liverpool Corporation, the annual report of Mr. A. G. Smith, the City Lighting Engineer, on the work of his department during 1913, which embraces the following: Public lighting; testing gas and electric meters; testing the gas supplied to the city for illuminating power, calorific value, purity, and pressure; testing consumers' gas pipes and fittings; and repairing and maintaining the gas-fittings in the majority of the Corporation establishments. A brief notice of the report appeared last week.

Public Lighting.

The work of installing automatic controllers proceeded satisfactorily; 3253 controllers having been fixed—making the total number installed 10,637. The total number of lamps in the city, including the newly-added areas, amounts to 19,883. Thus, the scheme is more than half completed. Fifteen new districts were formed, making a total of 55.

In consequence of the installation of these automatic controllers, the lamp-lighting staff has been reduced; and the work at the end of the year was carried out by 7 foremen and 83 lamplighters—a total of 90, as against 119 at the close of the previous year. The average number of lamps dealt with by each lighter was 112. Nine additional lighters and four automatic lamp attendants became entitled during the year to an extra 1s. per week for ten years' meritorious service.

The following tables give the number and description of lamps, together with the mileage of roads lighted:—

District.	Length of Roads Lighted. Miles.	Number and Description of Lamps in Streets.			Total Lamps, including Courts, Passages, &c.
		Flat Flame.	Incandescent.	Total.	
Old city	267¼	147	9,367	9,514	12,619
Suburbs	201	25	5,582	5,607	6,831
Totals	468¼	172	14,949	15,121	19,450

Compared with 1912, this is a net increase of 130 lamps; but in addition to this, 433 lamps were taken over in the four districts—bringing the total number of lamps to 19,883, or a total increase of 563.

The work of installing flame arc electric lamps in lieu of the old open type has almost been completed; an additional 77 lamps having been fixed. At the end of the year there were 12 open arc and 187 flame arc lamps in use; also 741 metallic filament lamps.

The total length of roads lighted at the end of the year (including the newly-added areas, but irrespective of courts and passages) amounted to 499¼ miles; 8 being by electricity, 475¼ by incandescent gas, 11 by flat-flame burners, and 5 by oil.

The entire maintenance of the columns, brackets, lamps, and fittings is carried out by a staff of 64 mechanics, &c.

During the year a revenue of £531 was obtained from the sale of material—including 92 lbs. of mantle ash.

Gas-Meter Testing.

The work in this department was again of a heavy character; the number of meters tested being 16,597, the fees for which amounted to £467 10s. Of this amount the Liverpool Gas Company paid £424 for the testing of 11,479 meters. Only 12 out of 276 dry meters were rejected; 78 out of 6244 wet meters; and 166 out of 4703 prepayment meters.

Electric Meter Testing.

The number of electric meters tested was 4687; being an increase of 15 per cent. on the previous year's figures, made up as follows: Electric Supply Department—approved, 1698, rejected, 1197; contractors—approved, 1441, rejected, 193; consumers—approved, 7, rejected, 12; sundry—approved, 120, rejected 19. The fees amounted to £116, to which must be added the sum of £220 paid by the Electric Supply Department.

Gas Testing.

Illuminating Power.—Tests have been made with the standard (No. 2 "Metropolitan") argand burner during the year; and the following are the average results. It will be remembered that the illuminating power under the new conditions was agreed upon at 18 candles, as tested by the old standard (No. 7) steatite batswing burner.

—	No. 2 "Metropolitan" Argand Burner.		No. 7 Steatite Batswing Burner.	
	No. of Tests.	Average Illuminating Power.	No. of Tests.	Average Illuminating Power.
		Candles.		Candles.
Office	305	22·43	305	17·54
District	104	21·61	104	16·38

Periodical tests have also been made during the year at the Fazakerley Gas-Works; the average result of 50 tests with the No. 2 "Metropolitan" argand burner being 19·95 candles, the standard being 20 candles.

Calorific Value.—542 tests have been made; showing an average of 563·93 B.Th.U. per foot of gas, net.

Specific Gravity.—290 records have been taken; the average being ·536.

Carbon Monoxide.—375 samples of gas have been taken in various parts of the city, and analyses made at the laboratory in Highfield Street, the average of which revealed the presence of 12·4 per cent. of carbon monoxide, representing an admixture of 25·2 per cent. of carburetted water gas. The maximum quantity—viz., 49·7 per cent. of carburetted water gas—was found at Garston; and the average of the test in this part of the city indicated the presence of 38·2 per cent.

The samples have also been tested for other constituents, with the following results:—

	Per Cent.
Carbon dioxide	1·08
Oxygen	0·50
Heavy hydrocarbons	6·64
Methane	30·50
Hydrogen	38·48
Nitrogen	10·40

Sulphur Compounds.—The following table shows the statutory limitation of sulphur compounds, together with the average results of 404 tests, involving 629 visits to the various works;—

Gas-Works.	Grains per 100 Cubic Feet.	
	Statutory.	Actual.
Wavertree	25	16·78
Caryl Street	25	17·00
Eccles Street	25	19·53
Athol Street	25	16·39
Linacre (Summer months—April to Sept.)	18	20·54
,, (Winter months—Oct. to March)	22	20·33

In addition to the foregoing, 86 tests were made at the laboratory in Highfield Street, to ascertain the extent of the presence of impurities, with the following results:—

	Average.
Sulphur compounds—grains per 100 cubic feet.	18·33
Ammonia	0·43
Sulphuretted hydrogen	entirely free.

District Pressure.—There were paid during the year 1092 visits to the seven pressure testing-stations throughout the city; the following being the average recorded maximum and minimum pressures at each of the stations, in tenths-of-an-inch water pressure:—

	Maximum.	Minimum.
Highfield Street	30½	20½
Argyle Street	26⅔	18½
Margaret Street	31½	21½
Athol Street	29	21
Harlow Street	31⅔	23¼
Durning Road	30½	22¼
Derby Road	26½	19

Naphthalene.

During the year the department dealt with 3935 reports of failures in the gas supply to public lamps, due to the presence of naphthalene, all of which were reported to the Company from time to time.

Expenditure.

The total charges in connection with the public lighting of the city and the supervision of the gas supply for the year amount to £54,678. A revenue of £3395 was derived from work charged to other departments and bodies, including a large portion of the gas-fitting work of the Corporation, which last year was again heavy. The net expenditure was therefore £51,283.

BOURNE GAS-WORKS PURCHASE.

Application for a Provisional Order.

Being desirous of purchasing the undertaking of the local Gas Company, the Bourne Urban District Council applied to the Local Government Board for a Provisional Order authorizing them to acquire the undertaking. An inquiry on behalf of the Board was recently held at Bourne—the Inspector being Mr. F. O. Stanford—when no opposition was indicated to the proposals. It was explained by Mr. S. R. Andrews (the Clerk to the Council) that the parties had agreed to the transfer of the undertaking; and the Directors had requested an offer from the Council. The Council were not on their own initiative able to state a price; and they called in Mr. J. Ferguson Bell to make a valuation. This he did twelve months ago; and on the basis of his figures an offer was submitted by the Council to the Directors, and eventually the price agreed upon was £12,500. In addition, there would be certain stock, fittings, and fixtures to be valued—probably at between £700 and £800—and (say) £600 for obtaining the Order, cost of transfer, &c.

Mr. Ferguson Bell, who gave evidence with regard to his valuation, said the works were well kept; and the plant was to a large extent modern, and suitable for the requirements of a works capable of making just over 13½ million cubic feet of gas per year. They were capable of making about double the present maximum output, which in mid-winter was about 60,000 cubic feet of gas per diem, and with a comparatively small expenditure could easily be increased to three times their present productive capacity. The Company was non-statutory; and since its inception in 1838 they had wisely adopted a conservative policy in respect to expenditure charged to capital account—by which he meant that, instead of paying high dividends, or issuing new shares, the Directors had spent considerable sums out of profits in the extension and improvement of the works and plant. The present capital of the Company consisted of 370 ordinary shares of £15 each fully paid, or £5500, upon which a dividend of 7½ per cent. had regularly been paid until 1912, when it was reduced to 6 per cent. Last year it was increased to 8 per cent. There were £2000 of 4 per cent. debentures, making a total of £7550; whereas according to the last published abstract of the Company's accounts, dated March 31, 1913, the total expended and charged to capital account amounted to £11,758.

Thus a sum of £4208 had been taken out of the profits of the Company, and expended upon the works and plant. The reserve fund of £3412 was not invested in trustee or other securities outside the business of the Company, but had been used for capital purposes and working the business. The consumers numbered 650, of whom over half were supplied on the prepayment system. There were about 480 gas cooking stoves on hire and supplied to slot consumers, and 101 public lamps; the pillars and lanterns being the property of the Council. The make of gas for the year to March 31, 1913, was 12,062,500 cubic feet. The unaccounted-for gas was 8·39 per cent., which he thought a very reasonable figure. There were 5½ miles of mains. Many of the service pipes were quite new. He put the present structural value of the works, buildings, plant, mains, services, meters, stoves, &c., as a going concern, at £10,640. The profits available for dividend for the last five years averaged, after payment of Directors' fees and debenture interest, £676 per annum. He estimated the maintainable profits at £625 per annum, calculated at twenty years' purchase; and this would give the value of the undertaking at £12,500, which was the sum agreed to by the Company and the Council, subject to the Council obtaining the necessary powers to purchase the undertaking. This sum was exclusive of stocks, stores, &c. The Company were to pay all outstanding debts to date of transfer, and to collect all accounts owing, or guarantee the outstanding debts to produce 20s. in the pound. He thought the purchase agreed upon was a fair and reasonable one, both from the point of view of the shareholders and the Council. There were strong indications that the Company was progressing. In 1903, they had 260 consumers, and the gas made was 9¾ million cubic feet; while this year there were 682 consumers, and the gas made was 13 million cubic feet. He ventured to suggest to the Inspector that sixty years should be allowed for the loan; and if the Local Government Board could not accede to this, he pleaded that it might be as near that figure as possible—more especially in view of the fact that the works were mostly new to a certain extent, and he did not anticipate that for many years the Council would think it necessary to spend anything upon them.

METER-RENTS AT NOTTINGHAM.

Playing to the gallery is a process alike common to municipal as to national political methods; and when at yesterday week's meeting of the Nottingham Corporation the proposal was again brought forward that gas-meter rents should be abolished, there were not wanting those who attributed to the authors of the resolution that it was primarily designed as a vote-catching expedient. The Socialist members of the Corporation, whose attenuated numbers are now indicated by the presence of two representatives only, were again responsible for raising the subject, which has become something in the nature of a hardy annual. They failed, however, to carry the majority of the Council with them, although receiving the support of the bulk of the Liberal representatives in the division—mainly upon party lines.

On previous occasions stress has been laid upon the fact that Nottingham is among the last of the large corporate authorities to persist in the perpetuation of meter-rents; and although this argument was not accentuated unduly upon this occasion, emphasis was laid upon the consideration that the charges made for registering appliances were of an entirely inequitable character, imposing a disproportionate burden upon the small compared with the large consumers.

Mr. H. Bowles, who brought the abolition resolution forward, urged that if it were submitted to a general referendum of the ratepayers, it would be carried by an enormous majority. The only thing suggested against it by Alderman Ball, the Chairman of the Gas Committee, when it was submitted twelve months previously, was that the time then was inopportune. The period had, however, now arrived when something ought most certainly to be done. In his (Mr. Bowles) view there was no more reason why meter-rents should be made a special charge upon consumers than there should be a charge imposed for the main taking the gas to a person's house. The consumers did not want the meters. The Gas Committee could take them away to-morrow, if they liked—so long as they left the gas. If members of the Council were only true to the statements which they made during the municipal contests, he had not the least doubt about the resolution being carried. Members of the Council told voters over and over again that they were in favour of wiping away meter-rents altogether.

Mr. A. Cullen, who seconded the resolution, contended that, as a progressive body, the Council ought to abolish meter-rents. The gas-meter was unproductive to the consumer; and the price charged was excessive in the case of small houses. While giving a partial support to the proposal, another speaker, Mr. E. Richards, urged that the resolution, if adopted, would not absolve the Committee from reducing the price of gas itself.

Alderman Sir John Turney, in opposing the resolution, said it was the wrong time of the year to make the suggested abolition or reduction of meter-rents. Let the balance-sheet of the gas undertaking be first produced, and they would then possibly see the force of his objection. Much had been said by the supporters of the resolution about these poor people paying so much. But they knew it was not true—they were only trying to get their votes.

Alderman A. Ball, the Chairman of the Gas Committee, pointed out that over 50 per cent. of the Corporation's customers were prepayment consumers; and the majority of those who were not were well able to pay the meter-rents. Assuming that the resolution was carried, they would be giving the small consumer something like a halfpenny a week, which after all was not much. It would entail a cost upon the undertaking of £6500, of which it must be remembered 20 cent. was at present received from outside customers. The price of coal had never been so high; while residuals represented a falling market. All the members of the Gas Committee were desirous of reducing the price of gas and making conditions for their employees as acceptable as possible. But having regard to the large capital invested in the undertaking, many important considerations must be borne in mind before any sweeping alterations were made.

Eventually the resolution was defeated.

LABOUR AT LEEDS.

Contract Work.—The Cost of the Strike.

Exception was taken by some of the Labour members, at last week's meeting of the Leeds City Council, to a recommendation of the Gas Committee that the tender should be accepted of Messrs. Leech, Goodall, and Co. for re-setting inclined retorts. Mr. Arnott remarked that it seemed strange the Committee could not see their way to place this work under the direction of the newly-appointed Manager. Mr. Gath stated that he was induced to vote for the appointment of the Manager, believing that in him they would get a man who would do the work of the Gas Department. Mr. Foster, following, said that Mr. Leech understood the business thoroughly; and yet they were going to the firm from which he had just retired, while they were paying him a salary to attend to the gas-works. Alderman Ratcliffe (the Vice-Chairman of the Gas Committee) replied that the question of who should repair these retorts did not rest with the Manager, but with the Committee. Mr. Leech had proved his ability immediately after he was appointed. He knew this work had to be done; and there would be a saving to the Committee in carrying it out of £142. He believed the terms were better than those on which they could carry out the work themselves.

Proceeding to refer to a petition for a reduction in the price of gas for trade purposes which had been forwarded by the Leeds and District Fish Friers' Association, Alderman Ratcliffe said that the income of the department for the last eight or ten weeks had gone down to the extent of more than £150 per day; and this state of affairs was likely to continue for some time, unless they could stir up new business. Every penny of the profit had gone; and large sums would continue to go unless some steps were taken to increase business. All the members of the Committee realized that the price of gas had got to come down if the department was to be maintained in a state of prosperity; and the members of the Council could rest assured that the Committee would take this step at the earliest possible moment.

WEST BROMWICH GAS AFFAIRS.

Mr. Copp's Services.

At a meeting of the West Bromwich Town Council last Wednesday, the Chairman of the Gas Committee (Mr. J. Brockhouse) referred with regret to the fact that they were losing the services of Mr. H. E. Copp, who had been with them for about 12½ years. He said Mr. Copp had been one of the most useful officials of the Corporation; and it had been a pleasure to work with him. He had always been most courteous, energetic, and pushing, and had done his utmost to further the interests of the undertaking. They were losing a valued public servant. He alluded to the strenuous work Mr. Copp had undertaken during the last twelve months in connection with the construction of the new vertical retorts, which had proved no easy task, in view of the labour unrest. The improvements carried out would make the works, so far as structure and plant were concerned, second to none in the kingdom. The Committee intended to appoint a successor at the same salary as Mr. Copp was receiving. With the object of increasing the gas consumption in the borough, the Committee had decided to supply gas cookers and fires on very low terms. They were spending something like £18,000 at the gas-works; and he trusted that the members of the Council and the public generally would take a greater interest in the concern.

Mr. W. Lawley (the Vice-Chairman of the Committee) also spoke in high terms of the works and worth of Mr. Copp, and said they all had a very excellent opinion of his abilities. He was one of the most capable and agreeable officers the Corporation had ever had. The Council approved the scheme for reducing the hire-rates of gas cookers and fires; and they decided to grant Mr. Copp a testimonial under the official seal.

A LOAN FOR GAS-MAINS.

Local Government Board's Strange Condition.

The Tredegar Urban District Council recently applied to the Local Government Board for a loan of some £10,000, which included £1326 for mains; and in regard to the matter, the "Western Mail" states that at last Tuesday's meeting of the Council a letter from the Board was read, saying the loans were approved, "on condition that no payments be made on Mannesmann steel tubes for mains."

Apparently no reason for the decision was given; but one member suggested that "the Mannesmann tubes rusted quicker than others, and this might be the objection." Another member, however, pointed out that in a district such as theirs was Mannesmann tubes were far superior to cast iron. The Gas Manager (Mr. D. W. Davies) said he was so startled that he telegraphed to the firm asking for names of towns and loans recently granted by the Local Government Board for Mannesmann mains. The reply included Blaenau Festiniog (30 years' loan), Chorley (37 and 23 years), and Cowbridge (21 years). He could not understand why the Tredegar Council were being treated like this. The tubes were acknowledged to be the best. Two years ago the Council laid steel mains to Troedyrhiwgwair, owing to the subsidences. The syphons had not been pumped till the previous week, when it was found there was absolutely no trace of water in any syphon. This was sufficient proof of the utility of the mains. They were covered with jute; and this method would have been followed in the present instance. The Board did not prohibit steel mains, but mentioned the Mannesmann. Mr. North suggested that it might be as well to write to the Board and ask them what their objection was, as it seemed like a boycott of the firm; but on the advice of the Clerk, it

was agreed that the Gas Manager should make a report to the Council, and they should then forward it to the Local Government Board.

In an interview subsequently with a representative of the "Western Mail," an official of the British Mannesmann Tube Company is reported to have said that the decision was quite inexplicable to the firm. Their tubes had been in use for ten or twelve years in this country, and had been in every way satisfactory; so that they could not imagine upon what ground the Local Government Board based their action. Outside this country the same tubes had been in use very much longer; and tubes examined after twenty years and more were found to be in perfect order. They had about 2000 miles of their tubes in this country. As to the suggestion that their tubes rusted more quickly than others, he said the firm had instances to the contrary, where their tubes had outlasted cast-iron pipes. In a street in Somerset, Mannesmann tubes were laid nine years ago by the side of cast-iron pipes; and while the latter had given trouble by corrosion, the steel tubes were giving perfect satisfaction. In a colliery district cast-iron pipes would be continually broken; and therefore steel tubes would undoubtedly be the best. He added that the firm had heard nothing about the Board's decision except from the Tredegar Council. So far as they had been able to ascertain, the Board had never before prohibited the use of the tubes; and in the case of the Blaenau Festiniog Council, the loan was granted after their tubes were laid.

Inquiries at the Local Government Board, it is said, elicited the information that an explanation would be shortly forwarded to the Tredegar Council; and therefore no statement could be made.

On Friday, the "South Wales Daily News" announced that their London representative had been able to obtain an "authoritative statement" as to the position taken up by the Local Government Board. The Board are, as already remarked, to explain the matter to the Tredegar Council direct; but meanwhile we give the statement which our contemporary's representative has secured. It is as follows:

> The Board do not appear at any time to have refused to sanction a loan for gas extensions because Mannesmann steel tubes were to be used. The Board, however, while giving thirty years for cast-iron tubes, give only twenty years for steel tubes when not tapped, and fifteen years when tapped.
>
> This is because the Board are advised by their engineering experts that steel tubes have a shorter life.
>
> The reason why the Board stated in their letter to the Tredegar Urban District Council that "the loans are approved on condition that no payments will be made in respect of Mannesmann steel tubes out of the amount now sanctioned for mains," was that the loans were being sanctioned for a period longer than they would be prepared to allow in the case of steel tubes.

Proceeding with his inquiries, the representative visited the Mannesmann Company, where he saw an official who told him that it was just possible that the Local Government Board had taken up the attitude they had on account of the Local Authority mentioning one particular class of tubing. He explained that the Board's policy was generally not to look with favour upon the specifying of any particular firm's goods. The reason the Council had put forward the Mannesmann tubes for the work was because there had been satisfactory results from the use of this tubing in the past, and it was particularly advantageous for colliery districts such as Tredegar. Being of solid drawn steel, the possibility of breakage was obviated; and the length of the tubes meant that there were comparatively few joints, which, in addition to the superiority of the joint itself, ensured that the risk of drawn joints and leakage was reduced to an absolute minimum. Mannesmann tubes had been sanctioned by the Local Government Board for use as gas and water mains on many previous occasions, and in some instances under a thirty years' loan. A case of their tubes being banned had not occurred before.

ILKESTON GAS PROFITS.

Having at last emerged from the troubles incidental to the mishap connected with their spiral gasholder, the Ilkeston Corporation are now in a fair way towards again reaping substantial advantages from their chief municipal trading undertaking.

The Mayor (Mr. J. A. Macdonald), who is a member of the Gas Committee, was able, at the meeting of the Council last Tuesday, to announce that it had been decided to hand over this year, from the profits of the gas undertaking, £5000 to the general fund. After making the grant, there will still remain a balance in hand of £6000, which is regarded as quite adequate to meet requirements. The Mayor pointed with special satisfaction to the result of the year's working, in view of the circumstance that the Committee had had to pay 3s. 2d. more for coal than in 1911-12. There had been in some previous periods a large loss occasioned through leakages of gas; but many of these had now been discovered, with corresponding financial advantage. That the aims of the Committee are also of a progressive nature, was indicated by the Mayor's announcement that negotiations are now in progress with a view to supplying the parish of Shipley with gas. About 7 million cubic feet would be required for this parish.

Mainly owing to substantial aid which the Gas Committee have been able to afford, the Corporation find themselves in the comfortable position of having a district rate for the coming year of 4s. in the pound—a reduction of 8d. upon the preceding twelve months.

Value of Incandescent Gas-Lights.—A striking instance of the value of incandescent gas-lights was given by Mr. Brockhouse (the Chairman of the Gas Committee) at last Wednesday's meeting of the West Bromwich Town Council. Referring to the rapidity with which the incandescent light was supplanting the flat-flame burner, he remarked that a case had just come under his notice where, in a certain public place, 24 incandescent gas-lights were doing the work of 130 lights with the ordinary class of burner.

OLDBURY GAS UNDERTAKING.

Reply to the Government Auditor's Criticism.

In their report submitted to the meeting of the Oldbury District Council on Friday, the Gas Committee made reference to the criticism of the Local Government Board Auditor on the accounts of the concern [*ante*, p. 382]. They stated that they had instructed the Manager (Mr. A. Cooke) to advertise for an extra slot-meter collector, and decided to issue receipts from a duplicate or counterfoil receipt-book for all amounts collected from these meters. They regretted that the Auditor's report was published without explanation—particularly with regard to the balancing of the accounts—as they feared a construction had been put upon the words used in the report which was not warranted by the facts. They would report fully as soon as the Manager had recovered sufficiently to return to the office. But, in the meantime, they desired to inform the Council that the complaint as to the balancing of the books related to small errors in book-keeping at the end of the years 1911-12 and the beginning of 1912-13. The errors were, as the Auditor stated, discovered during the audit by the staff at the gas-works, and were corrected; so that the accounts were properly balanced. The Committee assured the Council that there was nothing to which their attention ought to be directed pending the Manager's return.

Mr. WORTLEY proposed as an amendment that the recommendation for the appointment of an extra slot-meter collector be referred back to the Committee for further consideration. He said he noticed from the advertisement that they were offering the magnificent wage of 25s. a week; and he asked whether they expected to get a man who would be honest for this salary. He thought that they should pay the man at least 30s. per week; and he moved the amendment in order to attain this object.

Mr. BEACH asked the Council not to take the Auditor's report too seriously. While he realized that it was a serious matter to have such things put in a report, yet he was very much afraid it was the report of a comparatively young and ambitious official, who had got to make his way—"and seemingly," said Mr. Beach, "it did not matter at whose expense he made it." He (the speaker) held no brief for Mr. Cooke; but he was strongly of opinion that the report was prepared with the chief object of currying favour at headquarters. He believed that, when the report came to be calmly examined and carefully gone into, they would find there was very little the matter.

The CHAIRMAN (Mr. H. Jeffries) said it was owing to the Government Auditor's criticism that the recommendation for an extra slot-meter collector was made.

Mr. JACKSON remarked that he did not altogether agree with Mr. Beach, and was glad the Government Auditor had pointed out where their system might be improved. They were only small matters, it was true; but he believed there would be an improvement if the Committee's recommendation was carried out.

Ultimately the report was adopted, and it was agreed that the amendment should go to the Committee in the form of a recommendation that they should re-consider the salary of the extra slot-meter collector, with the object of increasing it to 30s. per week.

STREET LIGHTING IN BURNLEY.

At the last meeting of the Burnley Town Council, the Gas Committee's proposals for re-organizing the work of street lighting were approved. The proposals were contained in a report which had been prepared by the Gas Engineer (Mr. J. P. Leather).

Mr. Leather said that the lighting of lamps in Burnley is carried out by a staff of men who, in addition to lighting the lamps and extinguishing them at the appointed time, are employed during the day in the service of the Gas Department. The lamps in the districts of Briercliffe, Worsthorne, and Cliviger are automatically lighted and extinguished by clockwork controllers. The same system is also in operation within the borough in connection with about 160 lamps which have been recently fixed in back streets. These controllers require winding and setting once each week; and all the lamps need cleaning and attention weekly. The whole of the lighting staff assemble at the gas-works in the morning, so that each man may report any lamps which require special attention during the day, either on account of the inefficiency of the lighting or of broken glasses, &c. Nearly half of the staff are employed as yard labourers on the gas-works. The remainder attend to the cleaning of the lamps, burners, &c., and the winding and setting of the controllers.

The system described, he said, has some serious disadvantages: (1) The responsibility for the efficiency of the light and the durability of the mantles is divided between the man who cleans the burners and re-mantles them on the one hand, and on the other hand the lighter, who by carelessness in the use of his torch may easily damage the mantle. If each man attended to the lamps he has to light this would be avoided. (2) In summer time the men employed on the works work as labourers for the same number of hours as the yardmen—viz., 49½ hours per week. As they have to light the lamps in the evening, working as late as 10 o'clock, and again have to extinguish them in the early morning before 2 o'clock, their hours of rest are few and broken. Under these circumstances, they can hardly be expected to be so efficient in their daily work as men working alongside them who have had the opportunity of a good night's rest. (3) In winter time it is difficult for the works foreman to arrange the work of the men satisfactorily. Not only has he a much smaller staff before breakfast, but whatever may be the urgency of the work in which they may be engaged in the afternoon, the men who are lamplighters have to leave early. In the middle of winter it is necessary that all the lamps should be lighted before 5 o'clock in the afternoon. This means that they have to leave other work to get ready for lighting as early as 3.15.

Mr. Leather proposed that the lamplighting staff should be dissociated from the manufacturing department and employed entirely in connection with the distribution department, to which the work natu-

rally belongs. The excessive number of hours worked by the men in summer would be obviated by their not commencing work until after breakfast. The time before breakfast is at present not remunerative to the department. To enable each man to attend to his own lamps, and at the same time to give him sufficient work to occupy his time, Mr. Leather proposed to extend the system of lighting by clockwork controllers, so that, while each man will only light an average of 85 lamps by torch, he will have a much larger number (possibly 160) to clean and otherwise attend to. It will take some time to bring the new arrangement fully into practice; and experience will prove how many lamps can be satisfactorily attended to by each man. In some towns where the controller system is extensively used, more than 200 lamps are attended to by one man. The proposed alteration will entail some reduction in the staff of lighters; but it is not proposed to throw any man out of work. Some of the present staff wish to shortly give up lighting, and will be transferred to other work. The considerable increase in the number of lamps being erected would have necessitated an increase if controllers had not been adopted. The proposed reduction in the number of hours would entail a slight reduction in the summer wages, notwithstanding the increase of ½d. per hour recently decided upon. To compensate for this, Mr. Leather suggested an increase of 2d. per night for lighting and extinguishing. The weekly wage would then be £1 15s. 2d. for the greater part of the year, diminishing in the winter months, when the time of lighting encroaches on the hours worked in the fternoon, to a minimum of £1 10s. 7d.—the average of the whole year being £1 13s. 11½d.

CLAIMS OF GAS AND ELECTRICITY.

Views at a Coleraine Ratepayers' Meeting.

A full page of the local "Chronicle" is occupied by a report of a discussion which took place lately at a public meeting of the inhabitants and ratepayers of Coleraine. The gathering was held for the purpose of considering the advisability of recommending the Urban District Council to consider the question of undertaking an electric lighting scheme. The meeting had been called by Mr. Andrew M'Feeter (the Chairman of the Council), in response to a ratepayers' requisition; and there was a large and representative attendance. It was evident that the idea of having electric light arose from a recent suggestion in the Council that the expenditure of a sum of £3000 was necessary for extending and improving the plant at the gas-works in order to cope with the growing requirements. In the end, the public meeting decided, it is reported, "with practical unanimity, to request the Council to take the question of electric light into consideration, and to proceed with a scheme, provided they were satisfied that it would pay. It was emphasized that the electric light would be simply an auxiliary to the gas-works, which were recognized as a profitable municipal undertaking."

In opening the proceedings, Mr. M'Feeter, who presided, stated that he had quite an open mind on the question; and so had the other members of the Council. There was no doubt the large outlay contemplated in connection with the gas-works had led to the starting of the scheme. When, however, they thought of this outlay, they must remember that the gas-works started as a very small concern, and when Coleraine was a very small place. When they were conducting a progressive business like this, the outlay of money from time to time was always called for. There was at present a very large consumption of gas. It would be admitted that the lighting of the streets had been greatly improved during the last few years by the introduction of the incandescent mantle. On the other hand, he believed electricity to be the light of the future.

The principal speaker in support of the electricity scheme was Mr. Daniel MacLaughlin, who said the promoters of the scheme did not want to involve the town in any large expenditure of money; but it seemed desirable to take into consideration the question whether the £3000 it was proposed to spend on the gas-works might not be spent in another way which would be more effective. The instigators of the meeting did not come there as experts with a cut-and-dried scheme; but they had collected a few figures and some information. It was an admitted fact—whatever might be the cause of it—that the gas lighting of the town at present did not seem to be giving universal satisfaction. He did not wish to suggest for a moment that anybody was desirous of bringing a charge against the management of the gas-works. In Coleraine, they proposed to have overhead wires for electricity; and the cost for six miles of these through the streets of the town would be something under £500. The fact that the Council were the owners of the gas-works would assist the scheme, because the motive power could be supplied by gas-engines erected at the works. They were assured by experts that gas used in this way to drive engines to produce light by means of electricity was four times as efficient for purposes of illumination as when consumed in a mantle. For £270 a gas-engine could be procured which would give all the power necessary for the lighting of the town. The present price of gas was 3s. 4d. per 1000 cubic feet; and it would not be extravagant to say that, taken at the works by an engine, it could be supplied at 3s. They could sell electric current at 4d. per unit, which would work out far cheaper to the consumer than the present price of gas. The gas-works would go on as before; for gas would still be used by the prepayment consumers, and for cooking and heating. Current could be sold for power purposes during the day, when not required for lighting, at 1½d. per unit. The income that could be reasonably expected in Coleraine, and the saving which could be effected in street lighting, would far more than cover the outlay.

An incontrovertible statement was made by Dr. J. G. A. Kydd, when he said that if they could reduce the load on the gas-works, by means of the electric light, there would be no necessity to extend the works. Within the last fifteen years, he added, nearly £10,000 had been spent on the gas-works; and it would probably need £4000 to make the suggested improvements there, as schemes of this kind generally exceeded the estimate. On this, one of the audience quite pertinently inquired, "What about the electric light?" Proceeding, Dr. Kydd calculated that it would probably be possible to provide for 2500 lights of 32-candle power for the sum of money it was proposed to spend upon the gas-works. The average burner, with mantle, in a dwelling-house, he said, was not more than 16-candle power. He thought the candle power of the best gaslight they had was only 16. [Mr. J. Taylor, Gas Manager: 200-candle power]

Mr. T. G. Houston supported the electricity scheme; and Mr. J. O'Doherty (electrical engineer) said that by using suction gas they could generate electricity at ¼d. per unit. This explained "how, in small towns, private companies could sell it at 5d. per unit, and have a big profit."

The case for gas was championed by Mr. Daniel Christie, who said he was astonished at the suggestion that a sum of £3000 would provide an efficient service of electric light for Coleraine. It would light the main thoroughfares of the town. Dr. Kydd had mentioned an average light of 16-candle power. He could say that the worst light in Dr. Kydd's house was at least 16 candles. From the very best incandescent lamps, they would get anything from 200 to 250 candle power with a reasonable consumption of gas, and provided that the fittings were properly looked after. No doubt the upkeep of mantles was a drawback if the mantle was not properly taken care of. Personally, he did not spend half-a-crown a year on mantles in his own house. Did any ratepayer want to see Coleraine disfigured by an overhead wire system of electricity? The lighting of Coleraine as a town was second to none in Ireland outside Belfast. There was not one single person who had signed the requisition for the meeting who would be prepared to put his hand into his pocket and run a company for the installation of the electric light. He defied Mr. O'Doherty, or any other electrical engineer, to provide electric light at ¼d., 1d., or even 4d. per unit. Proceeding, he claimed that gas at 3s. 4d. per 1000 cubic feet was cheaper than electricity at 2d. per unit. The Coleraine Gas-Works were to his mind, and that of everyone else in the industry who had visited them, without exception one of the best in the kingdom for the size of the town. Ten years ago, the output of gas was 19 million cubic feet; whereas now it was 29 millions. They had a gas-engine at the works; and why did they not make electricity for themselves if it would be cheaper?

A member of the Council (Mr. W. H. C. Galt) stated that a Belfast firm had told him the smallest sum for which they could introduce electric light into Coleraine would be £10,000. The gas-works were no longer merely for the purpose of producing gas; they were also for the lowering of the rates of the town. If the officials were not careful to make so much money for the town, they could perhaps give them a little better gas.

It was admitted that Mr. Christie had put the case for gas very well; but he was not allowed to have matters all his own way. The cause of electricity was further espoused by Mr. Hugh Eccles, J P., who is reported to have said that "the cheapest gas in the United Kingdom was in Manchester, and there they had electric light. Probably Mr. Christie would dispute this. In Manchester at the present time with electricity they could have forty hours of ordinary room light for 1d. He did not think they could produce anything like this with gas."

There was more discussion before the resolution was passed asking the Council to take the matter into consideration.

DONCASTER AND THE SALE OF COKE.

Distributing in Small Quantities.

A long discussion on the retailing of coke by the Corporation took place at last Wednesday's meeting of the Doncaster Town Council—the result being, it was suggested by one member, a good advertisement for a new scheme brought forward by the Gas Committee. The scheme is set forth in the following minute of the Committee: "The Sub-Committee considered the question of the sale of coke in 1 cwt. lots, and recommended that the same be delivered at 9½d. per cwt., and a canvasser for orders be temporarily appointed at a weekly wage of 10s., with 1od. per ton commission on all orders from new customers; and that the appointment be left with the Chairman and Manager."

Mr. WILBURN, in moving the non-confirmation of this minute, said it seemed to him that the Committee proposed to carry on the business of coke hawkers, and so interfere with the legitimate business of ratepayers of the borough. They intended to engage a canvasser to go and secure orders. The present price of coke was 12s. 6d. per ton at the works, and any carter would deliver it at 2s. per load; but at the price the Committee proposed to charge it worked out at 15s. 10d. per ton. So far as his experience went, it was often difficult to get supplies of coke from the gas-works, and he did not see why it should require an official upon a salary and commission to obtain orders. Would people who had been in the habit of fetching their own coke have to place orders with the Gas Committee's canvasser? If not, it was certain that orders placed direct would receive first attention, and other people would possibly have to wait. The proposal would be of no benefit to the town, no saving to the consumer, no profit to the department, and he did not think that it would add any dignity to the Corporation to hawk coke.

Alderman ARMITAGE said coke was their most important residual; and it was becoming a big question with gas companies throughout the country as to how to get rid of the large quantities which accumulated in their yards. Every now and then the Committee had to take some special means of getting rid of these accumulations; and sometimes they disposed of some of the coke for shipment. Now they had adopted the method which had been foreshadowed. If any better plan could be shown them, they would be willing to take it up.

Mr. MORRIS said he thought this had arisen from the fact that the Gas Committee sold 100 tons of coke at 10s. per ton. The question arose as to whether it should be sold at such a ridiculously low price when large consumers in town had to pay as much as 12s. 6d. The Gas Manager (Mr. Robert Watson) told them he was overstocked with

coke, and was compelled to sell at this price. This led the Committee to agree to the hawking of the coke.

Mr. CRAWFORD remarked it would be interesting to know why that which was not undignified in private enterprise became undignified when a municipality did it. What was the difference between the burgesses supplying themselves with gas and with coke? They had a right to participate in the surplus supplies of coke; and the Committee had merely authorized the Manager to do what any private individual would do in his business. The primary object of municipal concerns should not be to make profits, but to supply the maximum service at the minimum cost to their own people. He strongly opposed the amendment.

Mr. CLARK emphasized that it was merely a temporary expedient of the Committee, destined to benefit those who wanted small quantities of coke, and who lived a long way from the gas-works, as well as those who lived near the works. The Committee had, he said, spent many hours of thought over it; and it was rather hard at the first opportunity an attempt should be made to upset the experiment.

Mr. WIGHTMAN (who had seconded the amendment), after some further remarks, expressed his pleasure at the turn the discussion had taken, and withdrew from seconding Mr. Wilburn's proposition.

Mr. WILBURN adopted the same course, saying that the public would now understand the true meaning of the Committee's proposal.

The report of the Committee containing the minute was confirmed.

MR. HOPE'S CO-PARTNERSHIP BILL.

A Discussion in the City.

There was introduced in Parliament by Mr. James Hope a few days ago a Bill (which has also been presented by him on previous occasions) to "promote the adoption of co-partnership by statutory and other companies." The Bill is influentially supported; and it deals with a matter which is coming increasingly into favour as time goes on. Last Friday afternoon, the author of the Bill attended at the London Chamber of Commerce to address the members on the subject; and a useful discussion took place.

Mr. STANLEY MACHIN (Vice-President of the Chamber) occupied the chair, and in opening the proceedings explained that the Bill was an endeavour to meet the existing labour unrest by giving the wage-earners a share in the profits of a business. The Chamber could not, he said, assist in any more valuable work. Personally, he believed there were many grave difficulties to overcome in any such system as Mr. Hope would outline. They must be careful not to do anything that might stifle private enterprise. If any remedy should be suggested that would cripple or would diminish the enterprise which had hitherto marked this country—he meant, reduce the possibility of capital being profitably employed—he could not help thinking the remedy might well be worse than the disease.

Mr. HOPE began by remarking that the wide varieties of conditions of industrial enterprise made it imperative that any scheme brought forward should not be cast iron. It must be tentative and elastic; and if he had put forward a plan in the shape of a Bill, this merely meant that he had done his best to formulate what he hoped might serve as a model scheme. Sir Fortescue Flannery, Bart., one of the Directors of the South Suburban Gas Company, had authorized him to say how entirely he was in agreement with the general scope of the proposals of the Bill, and how much he regretted not being able to be present at the meeting. The problem they had to solve was much easier where wages formed a small and materials a large proportion of the expenses of an enterprise, than where these conditions were reversed. But the more he saw the more he was convinced that the necessity of the present day was to create what he would call a visible, tangible, and automatic community of interest between employers and employed. Of course, community of interest really existed at present; but it was not always evident to the working man. Business men knew the difficulties of industrial enterprise; but they could not be easily realized by working men. Modern developments had tended to accentuate the apparent conflict of interest between employers and employed. The element of human sympathy became weaker with the growth of limited liability enterprise; and, moreover, subdivision of labour must lead to monotony and loss of interest. They ought to find some system which would give men a greater stimulus in their work, which would make everybody from top to bottom work together with one aim and purpose, in a way that could not be secured by a fixed wage with no sufficient sense of security.

THE PROVISIONS OF THE BILL.

This being so, he had framed his Bill, the effect of which was purely permissive in the case of limited companies. But in the case of statutory companies there was what he might call contingent and qualified compulsion. A statutory company going for an Act would have to show cause to the Parliamentary Committee why the scheme should not be adopted. In many cases, no doubt, it would be proved to be inapplicable. So far, gas-works had exhibited the greatest success of the principles for which he was arguing. The root idea of the scheme was that there should be a standard return for capital and a standard wage for labour; and when these two things had been secured, there should be a division of the remaining profits. He had taken the standard return for capital at 5 per cent.; but it might vary with the value of money. The return was not to be calculated on the nominal capital, but on the money actually paid up, whether by way of loan or share capital. Of course, it was impossible to define what the standard return for labour should be. This must be left to voluntary agreement, as before. The operation of the scheme, however, must not lower the standard rate of wages at all. Once this basis was arrived at, it was suggested that for every 1 per cent. extra paid to the shareholders, an extra one-twentieth of their wages should be handed to the workpeople. Of course, it was not desirable from any point of view that very large bonuses should be given in cash. This had been recognized by the pioneer South Metropolitan Gas Company. Therefore it was proposed that the money should be paid over to trustees, who would be obliged to invest it, if it came to more than one-quarter of the standard wage (as would happen in the case of very successful concerns). Further, if possible, the funds were to be invested in the shares of the company itself. This, he believed, had been a great factor in the success of the South Metropolitan scheme. But it could not always be done. South Metropolitan gas stock had a wide market, and could always be bought; but in some cases the result would be to drive up the shares to a very high figure. Among the other provisions was one for the election of directors by co-partners. This was one of the most difficult of the propositions, and business men had told him it would lead in many cases to great trouble. He could only say he believed this had not been the experience of the companies that had adopted co-partnership. Both Mr. Charles Carpenter (the Chairman of the South Metropolitan Company) and Sir Fortescue Flannery had told him to say that their experience had been quite the other way—that the directors elected by the workmen shareholders had been no hindrance at all, but, on the contrary, a very great help in the conduct of the concerns. He then explained the various provisions of the Bill [which will be found set forth in the "JOURNAL," Vol. CXVIII., p. 993]. Concluding, he pointed out that the scheme was not put forward in any dogmatic spirit. He hoped the Bill would bring to light all the difficulties and criticisms; although he admitted that he feared its chance in Parliament this session "was not very rosy."

A GAS DIRECTOR'S VIEWS.

Mr. L. W. S. ROSTRON (a Director of the South Metropolitan Gas Company), after stating that Mr. Carpenter could not possibly get to the meeting, said he agreed with every word Mr. Hope had said as to the advantages of co-partnership. The case for co-partnership, he agreed, was that it gave a workman an obvious community of interest with his employer. As things were without co-partnership, unless a man went into the economics of the subject, it did not seem to matter much to him whether the business did well or badly. He did think it was important to give to men a community of interest with the employer which everybody could understand and nobody could fail to see. This scheme did undoubtedly bring employers and employed into closer touch with each other. It went a long way towards re-establishing the old relations between the two parties. In most cases there were co-partnership councils or committees, at which members of the Board met representatives of the men to discuss the scheme, and anything else that might crop up in the business. A committee of this sort brought the parties together. Again, such a scheme offered the men a very convenient and simple means of saving their money. It was hard in the ordinary way to save a little bit at a time; and it was not easy to know where best to put the money. Co-partnership provided ready and automatic means of saving and of increasing the men's prosperity. Lastly, it did something to meet the difficulty of giving the workman a share in good times. When the standard rate of wages was in the first instance fixed, it must be arranged at a figure which could be maintained in all years. From all the points of view he had named, co-partnership schemes were undoubtedly of very great and direct benefit to the employees. The result of their adoption had in almost every case been greater contentment, greater interest, and a better spirit generally on the part of the men. The employer got an adequate return in the better way in which the men did their work. As to the Bill, he felt doubtful about it; and it did not seem to him to be necessary. He did not know whether his own Company, or other gas companies, had any express powers to adopt a scheme; but no one had ever found any legal difficulties in doing so. Certainly, most undertakings were able to adopt a scheme if they liked. If companies were in the legal position of being able to adopt, if they chose, a co-partnership scheme of any kind they might agree upon with their men, it was obvious that a Bill setting forth any particular kind of scheme would prove to some extent a handicap and an obstacle to the spread of the system. He had also grave doubts as to whether it was desirable that compulsion should enter into the question. What was needed was a Royal Commission. They wanted the experience of those companies who had gone in for co-partnership to be as widely known as possible. It would be preferable to work by example rather than by compulsion. His Company were one of the few to have employee directors; and all agreed that the system worked very well. But Sir George Livesey did not bring this idea forward until the scheme had been going for some years, and the employees had a substantial holding in the Company. If one took up the position that, when a scheme was started, before the men had become large shareholders, they were entitled to immediate representation on the Board, he could not help thinking that this would be a stumbling-block to many who might otherwise wish to adopt the system. Again, if the savings were invested outside the company, this would militate very much against the value of the scheme. Unless a man was going to invest his savings in the company, it was not co-partnership at all.

OTHER SPEAKERS.

Mr. JOHN W. HOPE said that unless an employer made up his mind to tackle the subject with goodwill, whatever arrangements might be made would be doomed sooner or later to non-success. If the money was invested outside, they would take away at once the incentive to the men to do their best in their business.

Mr. WILLIAM PEARCE, M.P., expressed the opinion that it was necessary to show the working classes that it was possible to give them greater interest in their work, and means of bettering their position. He had inquired into the South Metropolitan scheme, and found that the men had a substantial bonus on their wages, and also security of employment for a definite time. He believed in most cases they were given assured employment for a year; and this was a great attraction to the workman. They had to try to mollify the trade union suspicion that co-partnership was against their interests. He proposed a vote of thanks to Mr. Hope.

Mr. A. BARTON KENT, in seconding, expressed some doubt as to the value of employee directors in certain businesses.

Sir STAFFORD HOWARD supported the vote, but said he would much rather leave the matter of co-partnership to individual effort.

Mr. HOPE, in acknowledging the vote, said that it was largely on

account of its success in the case of the South Metropolitan Company that he inserted the provision for employee directors. As to whether there was any need for legislation on the permissive side, he was informed that there was. In many cases otherwise it would be necessary for companies to obtain powers to enable them to adopt a scheme. He wanted to get the basis of the proposals examined by a Select Committee, who he thought would be, in a matter like this, a far better tribunal than a Royal Commission. But there would have to be some reference to the Committee; and the best reference would be this or some other Bill.

The proceedings were brought to a close with a vote of thanks to the Chairman for presiding.

WATER FOR FIRE EXTINCTION IN LONDON.

County Council v. Water Board.

As shortly reported in the "JOURNAL" last week (p. 602), the London County Council had before them, at a meeting on Feb. 24, a long report by the Fire Brigade Committee on the subject of the supply of water for the extinction of fires; and the Committee submitted the following recommendation: "That steps be taken with a view to a further conference between representatives of the Council and of the Metropolitan Water Board relative to the questions outstanding between the Council and the Board as to the supply of water for fire extinction purposes; the conference to be held on the basis that neither the Council nor the Board is responsible legally for the provision of an adequate supply in places where the existing supply is insufficient, but that it is desirable that a settlement by consent should be arrived at in the matter."

Mr. J. D. GILBERT moved that the recommendation be referred back to the Committee. He said the question of the supply of water for fire extinction had been under consideration by the Council since 1906; and the position arose out of the conditions under which the late Water Companies obtained the monopoly for the supply of water to London. These conditions were that they should provide free all water required for the extinction of fire. He had always contended that "free" meant "sufficient" water. For a great many years the supply had been both free and sufficient; and it was only since the establishment of the Metropolitan Water Board that a difference of opinion on the subject had arisen. The Board took up the position that they were not legally bound to supply sufficient water for fires, but only for domestic purposes. The Fire Brigade Committee had always agreed that the Council's case was that it was the duty of the water authority of London to supply sufficient water for fire-extinction purposes; and the case now before the Council, and the one which some time ago went to arbitration and was decided against them, was that in future the Board would only carry out their domestic supply duties, and if the Council wanted sufficient water for fires and new mains they were to pay part of the cost. This, he submitted, was never intended under the original Water Acts. The proposal of the Committee was to have another conference with the Board. They had already had several conferences which had been useless. The only way in which the view of the Council on the question could prevail was for them to go to Parliament, and insist on the Board, as the water authority, supplying free and sufficient water for fires. To this the Council, as the authority for dealing with fires in London, were entitled.

Mr. E. SMITH, in seconding the motion, said he did not think any member of the Water Board who might be on the Council would deny the statement that it was notorious that in certain parts of London, where the character of the neighbourhood had changed, although the supply of water was adequate ten or twenty years ago, it was altogether inadequate now, even for domestic purposes. It was all very well to have the proposed conference; but they had been having conferences for nine years, and they had proved fruitless. They would never get this question settled until they had an inquiry by Parliament.

At this point the debate was adjourned till last Tuesday.

Mr. J. B. P. KARSLAKE said that, though the New River Company was formed to supply London with water, a careful investigation of all their Charters and privileges showed that no mention whatever was made as to the Company bringing water to London for fire-extinction purposes. It was only at the beginning of the Seventeenth Century that this became a matter of any real concern to the London authorities of that day. The first Statute dealing with the water question was dated about 1610; and the "sudden adventures of fire" were given in the preamble as an object for which the Company were authorized to bring water from Hackney Marshes for the benefit of King's College, Chelsea; but no further reference was made to the matter in the Act. Later, in 1721, the Chelsea Company, when they obtained powers of supply, were placed under an obligation to erect pumps which were to be kept charged for the benefit of fire-engines. In 1747, the owners of the old West Ham Water-Works, which eventually became merged in the East London works, were made to set up in certain convenient public places pipes for filling fire-engines; and so matters were left until the beginning of the last century, when the Consolidated Acts were passed. No obligation whatever was put upon the Water Companies to provide water for fire purposes, or to enlarge their mains, or in any way to supply more water than was required for the ordinary domestic uses of their customers. In the early part of the last century the actual protection of London from fire was in the hands of the Fire Insurance Companies; and he believed it would be found that they made certain arrangements with the Water Companies to supply them with watert But so far as the public authorities were concerned the provision or water was apparently left entirely unregarded. Having given a chronological record of the further steps taken in connection with the matter down to the present day, the speaker, in conclusion, said he did not think it was right that two public bodies like the Water Board and the

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County Council should have been unable, in the course of ten years, to arrive at some agreement in this matter; and he appealed to the Council to pass the Committee's recommendation, in order that the Council and the Board might discuss the matter amicably, and go to Parliament to obtain the necessary powers to provide what was absolutely necessary for the safety of London, and what had been far too long delayed by the action of both bodies in trying to force one or the other of them to undertake the duty.

Mr. L. W. S. ROSTRON fully supported the recommendation, and remarked that it was high time the two authorities concerned came to some rational arrangement for meeting the enormously important public necessity before them. He inclined to the belief that the delay in settling the question was due to the unreasonable attitude of the Council in insisting that the Water Board should be called upon to lay, without any cost to the Council, mains required solely for fire purposes. The water consumers in the Board's area were totally different people from the ratepayers in the County of London, and yet the Board were called upon to provide water for fire extinction for the benefit of the inhabitants and property-owners in the county. The people who had property in the county were those who, in justice and equity, ought to pay. If the Water Board were to be placed under an obligation to supply free water for fire extinction, large property-owners in the City who had sunk wells, and did not get their domestic supply from the Board, would not contribute a penny towards the reasonable protection which they wanted and ought to have.

Lord HADDO expressed the hope that the Committee's recommendation would be adopted, and said he thought there was no reason why they should not try to arrive at an agreement in the matter rather than incur law costs, which the Council very often did in matters that might be settled amicably.

Mr. F. H. CARTER (the Chairman of the Committee) thought the fact that the matter had been hanging over their heads for ten years was a good reason for settling it at once with the Water Board.

On Mr. Gilbert's motion being put, it was lost by a large majority; and the recommendation of the Committee was adopted.

Kingstown Lighting Scheme.—In connection with the proposal of Mr. Muldoon, M.P., to instruct the Parliamentary Committee considering the Dublin and Southern District Electric Supply Bill to insert a clause providing for the transfer of the undertaking to the Urban District Council within such period, and on such terms and conditions, as may be approved, it is hoped by the promoters of the Bill that when the matter comes up in the House of Commons to-day (Tuesday) it may be ruled out of order; their contention being that the proposal represents "a very transparent attempt to override the system of procedure by which Provisional Orders are considered on their merits by Private Bill Committees." Mr. T. M. Healy protested against the instruction when the Bill was before the House last week; but the Speaker was not prepared to give a ruling at the moment, and an adjournment was granted.

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

The proposed scheme to erect on the south side of Glasgow a garden suburb, in which the heating and cooking are to be carried on entirely by electricity, gives a hint which might be well taken up by gas undertakings where new property is to be erected. Why should the builders of these estates not be canvassed to allow gas departments to fit out the houses, so that gas should be the means by which not only lighting, cooking, and heating might be done, but also be used for many other purposes to which it can be applied in connection with domestic labour-saving? The fact that gas-grates can now be obtained to suit all styles of decorations makes the installation of gas-fires an easy matter for the builder; and when the houses are fitted up, there will be at once evidence of the great advantage and saving in labour which will soon show itself in the readiness with which houses so supplied will be sought. Around many gas-works there are houses which are the property of the gas department or company; and these might first be fitted up, so that the public might see that the gas suppliers practise what they preach. It is to be feared that there are not many of such houses fully installed with gas apparatus, though the manager's house may be fairly completely fitted up. As the fuel required by the employees is usually supplied by the gas department, the difference between the price of gas and coal would make a very small, if any, increase in cost.

The new Company at Slamannan are evidently pushing forward their commodity, as they are increasing the size of the mains in the principal streets, and have induced the members of the Lighting Committee to see that additional lamps are required for the better lighting of the district. Possibly the members of the Committee were already aware of the necessity of this extension of the lighting, and have been waiting the present favourable opportunity for bringing it forward. The recommendation is for 38 additional lamps; and before these can be installed the Lighting Committee have to recommend the matter to the general meeting of the members of the Parish Council, who, in turn, pass it on, with comments, to the County Council. As, however, this is purely a local rate, chargeable to the constituents of the Lighting Committee, and not requiring any assistance from the county rates, it would seem hardly necessary to have this roundabout procedure and the approval of so many bodies.

The County Council of Stirlingshire decided to form a lighting district to cover the same area as the Redding drainage district; and the contract was entered into with the Polmont and District Gas Company for the erection of lamps, and also for the lighting, extinguishing, and maintaining of them. The scheme has proved so satisfactory that the inhabitants in Polmont, Brightons, and Wallacestone have asked that these districts should be made a special lighting area.

The Sub-Committee of the Glasgow Corporation Watching and Lighting Committee on the lighting of the city have been motoring

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around the various districts in connection with the scheme for the improved lighting of the streets. Particular notice was taken of Great Eastern Road and Dumbarton Road, so as to have a continuity of the highest standard of lighting on this main thoroughfare, which runs through from east to west. Other districts also received attention; and the efforts of Mr. Langlands to give Glasgow adequate illumination in accordance with the traffic of its streets must commend itself to both the Sub-Committee and the inhabitants generally.

The Musselburgh Gaslight Company are not to obtain the ground for the extension of their works from the Town Council without some trouble. These gas-works, it may be remembered, are upon the borders of the race course and golf links; and it has been claimed that this extension will interfere with one or both of these amusements. The Town Council, however, agreed, with only one dissentient, to grant a feu to the Gas Company at the rate of £50 per acre, after the formality of public roup. At a special meeting of the Town Council held last night in private, intimation was made, on behalf of Parish Councillor William Murray, of his application to the Court of Session for interdict against the Town Council to prevent them going on with the feu of public ground for the extension of the gas-works. This matter has since come before Lord Anderson, in the Bill Chamber of the Court of Session. After hearing Counsel, his Lordship granted interim interdict, ordered answers to be lodged, and declined to ordain the complainer to find caution.

The Peterhead Gas Committee have reported to the Town Council regarding the question of the introduction of electric light and power into the town. The Gas Manager has submitted his report, and has been instructed to communicate with the larger consumers as to whether they would be willing to have a service of electric light installed. These circulars are to be sent to all the consumers. Full consideration of the Gas Manager's report has been adjourned until the next monthly meeting. The Peterhead Gas-Works are in the hands of the Town Council; so that the proposal to add electric lighting is not being brought forward for the purpose of opposing the present gas undertaking, but as an addition to it. There is no doubt that, in towns the size of Peterhead, if electricity is required there is no better place to generate it than the gas-works, and no one better able to deal with the question of lighting than the Gas Manager.

Questions were asked at the last meeting of the Motherwell Town Council as to the delay in the taking over of the gas-works. It was explained that Mr. Hislop, the Arbiter, had been laid up for several weeks, but was now able to attend to business, and the matter would be proceeded with. It was hoped that the result would be known within a month or six weeks. There appears to have been great difficulty in getting details as to the value of the land.

The Kirkcaldy Provisional Order has been adjusted, by amendments, so as to satisfy the Dysart Town Council with regard to the limits of supply within the latter burgh, and with reference to the laying down of pipes in the streets and the repairing of the latter. The Town Clerk of Dysart has therefore been authorized to have the petition withdrawn. The question of the adoption of automatic lighting was also before the meeting, and the views of certain councillors who had visited several towns where the system was in use were given. The general idea seemed to be that the alteration of the lanterns from the present round pattern to the more modern square type would add considerably to the cost of the scheme; and it was proposed that the first thing to be done was gradually to change the pattern of the lantern, doing a certain number each year, and then, when they were all altered, to go again into the matter of the automatic lighting. It was pointed out that the present lamps only consume 2 cubic feet per hour, as against 3½ to 4 cubic feet elsewhere. One councillor claimed that it was the "worst lighted town in Scotland;" and he moved an amendment that the Committee should get an estimate of the cost of the scheme. But the decision of the Council was that they should wait and see what the future of automatic lighting would be.

There is to be a special meeting of the shareholders of the Leven Gas Company to consider the offer of the Buckhaven Town Council for the pipes, meters, &c., belonging to the Company in that burgh. A motion is to be proposed that the whole matter be referred to the Directors, with authority to proceed to arbitration if necessary.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

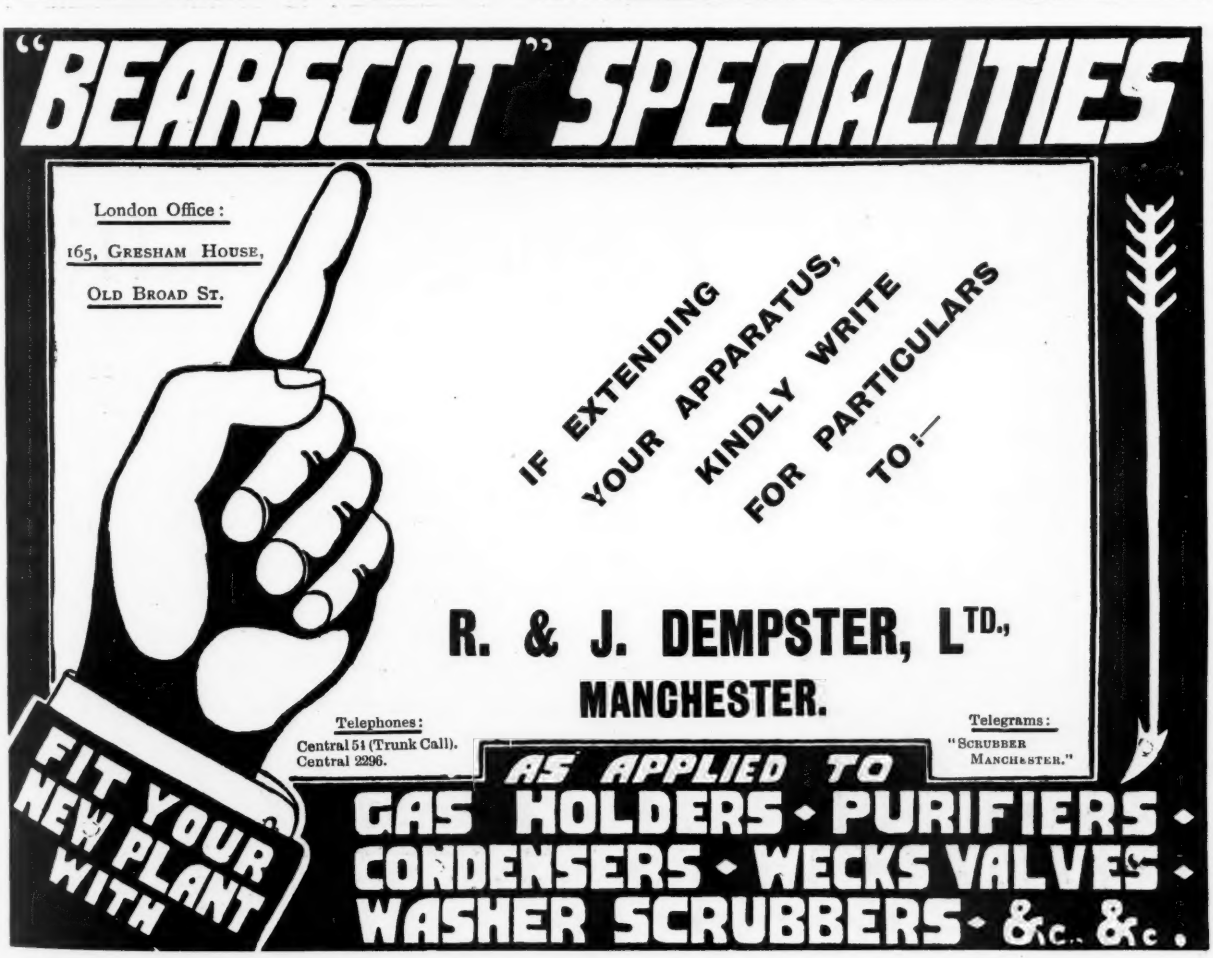
There is very little new to report as to the position of the market for London tar products during the past week.

Pitch may be put at 39s. net per ton; creosote in bulk, at 3⅜d. net per gallon; 90-160 solvent naphtha 10⅜d. net and naked; toluol, 90-160, 1s. net and naked; 90 per cent. benzol, 1s. 2d. net and naked; 60's crude carbolic, buyers at 1s. 1d. net, casks free, sellers 1s. 2d.; anthracene, 2d. per unit for 45-50 per cent.; pyridine, 8s. 3d. net and naked, buyers offering 3d. per gallon less.

Sulphate of ammonia remains at £12 to £12 2s. 6d. The exports for last month are almost identical with the quantity exported in February last year. A considerable quantity, however, which was intended for shipment last month, did not get away in consequence of delay in arrival of steamers through bad weather. The March exports will therefore benefit to that extent.

Tar and Tar Products in the Provinces.

The average values during the week were: Tar, 26s. 3d. to 30s. 3d. Pitch, east coast, 38s. to 38s. 6d.; west coast, Manchester, 37s. 6d. to 37s. 9d.; Liverpool, 38s. to 38s. 3d.; Clyde, 37s. 6d. to 38s. 6d. Benzol, 90 per cent., naked, North, 10½d. to 11d.; 50-90 per cent., naked, North, 10⅛d. to 11d. Toluol, naked, North, 10½d. to 11d. Crude naphtha, in bulk, North, 5d. to 5¼d. Solvent naphtha, naked, North, 9¼d. to 9¾d. f.o.b. Heavy naphtha, naked, North, 9d. to 9¼d. f.o b. Creosote, in bulk,



North, 3⅜d. to 3¼d. Heavy oils, in bulk, 3⅜d. to 4d. Carbolic acid, casks included, 60 per cent., prompt, east and west coasts, 1s. 0½d. to 1s. 1d. Naphthalene, £4 10s. to £10; salts, 55s. to 60s., bags included. Anthracene, "A" quality, 1½d. to 1⅝d.; "B," nominally ⅜d. per unit, packages included and delivered.

Sulphate of Ammonia Prices in the Provinces.

LIVERPOOL, *March 7.*

During the past week there has been little animation in the market for this article, but prices have not declined much further. There has been a fair demand for home consumption, but new orders for export have not been plentiful. The nearest values at the close are £12 7s. 6d. per ton f.o.b. Hull, £12 8s. 9d. per ton f.o b. Liverpool, and £12 10s. per ton f.o.b. Leith. For future delivery the tone has also remained dull, and it is reported that first-hand business has been done over the second half of this year at £12 3s. 9d. per ton f.o.b. good port.

Nitrate of Soda.

The market for this material is steady, and quotations are maintained at 10s. 7½d. per cwt. for ordinary and 10s. 10½d. for refined quality, on spot.

From another source it is reported that the market for sulphate of ammonia has been very quiet during the past few days, and though the prices are not written actually lower yet, the values put on the article to-day cannot really be obtained for prompt shipment. Outside London, makes are quoted at £11 17s. 6d.; Hull, £12 8s. 9d. to £12 10s.; Liverpool, £12 10s.; Leith, £12 12s. 6d.; Middlesbrough, £12 8s. 9d. to £12 10s.

COAL TRADE REPORTS.

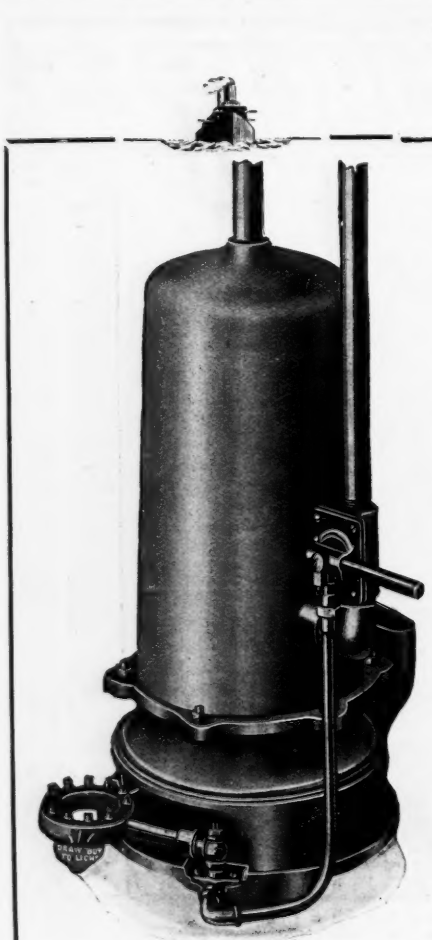
Northern Coal Trade.

The coal trade is a little steadier, with some large contracts in the market for both Denmark and Norway. For steam coals for early shipment prices are maintained. Best Northumbrians are about 13s. 6d. per ton f.o.b.; for second-class steams 11s. 7½d. per ton is quoted; and for steam smalls from 6s. to 7s. 6d., according to quality. The price for best steams, with delivery over the season, is now about 13s. per ton f.o.b. In the gas coal trade, best Durhams are fairly steady; 13s. 6d. per ton f.o.b. being the current quotation. Second-class gas coals are 11s. 9d. to 12s. 3d. per ton; and "Wear specials" are near 13s. 6d. to 13s. 7½d. per ton f.o.b. Among the contracts placed is that for the Horsens Gas-Works—some 8500 tons, the price of which delivered is about 17s. 6d. per ton for specials—and that for Veile for 4000 tons, at about 16s. 9d. delivered. For Rouen also sales are reported at a price below that current. In such instances, the amount left for the coal, f.o.b., is influenced by the sea freights, which are now lower than they were a year ago. Other contracts are in the market. Coke is steadier. The output is less at gas-works, as well as at the coke-ovens. Good gas coke is from 13s. 6d. to 13s. 9d. per ton f.o.b. in the Tyne.

Wandsworth Gas Employees' Annual Dinner.

The annual dinner of the employees of the Wandsworth, Wimbledon, and Epsom District Gas Company was held on Saturday, the 28th ult., at the Wandsworth Baths, which were lighted for the occasion by high-pressure gas-lamps. The Company's Engineer (Mr. H. O. Carr) presided; and he was supported by the Secretary (Mr. C. W. Braine) and a number of local business men. The Chairman, proposing "Prosperity to the Company," expressed his pleasure at the fact that there had been an increase of 8 per cent. in the sales of gas in the past half year. They had placed on the books 1200 new consumers; but they had put in twice this number of new stoves and cookers, which showed that consumers were appreciating more and more the value of gas in their houses. Wandsworth was a valuable position for a gas company to hold. It was on the Thames, which river was the key to London. It was also the key to the success of the Company, and had undoubtedly led to the amalgamation which had taken place. They had cheap coal by the river, brought down by their own ships, of which they had now two; so that they were able to get coal to Mitcham much more cheaply than formerly. Coke fuel had been tried for driving one of the ships—the *Wandle;* and the experiment had been attended with excellent results. A very healthy state had come about with regard to the roads, which were practically all sprayed with tar, thereby rendering them dustless. In conclusion, Mr. Carr said there was no question about the prosperity of the Company. Mr. Braine, in responding, said this prosperity was linked-up with everyone present; for unless they did their part to further its interests, the Company would "go to pot." The workmen were shareholders in the concern, the Board was selected from the three Companies concerned, and there was at the head a gentleman who really had no equal in knowledge of the gas industry. He referred to Mr. Jones. The men did their work well; and their efforts were appreciated by the Directors. Mr. Braine proposed "The Visitors," which was responded to by Alderman Cresswell, who spoke in appreciative terms of the Company; saying they produced not only the cheapest but the best gas. He had never been in the Baths when there had been such a rich, effulgent light as he saw that night. Other toasts, including "The Chairman," followed. An enjoyable musical programme was provided.

Manchester Gas Charges.—The proposals in connection with the Manchester Gas Department to reduce the price of gas supplied to large consumers, which were set forth on p. 595 of last week's "JOURNAL," came before the City Council at their meeting on Wednesday, and were adopted by the Council, on the motion of Mr. William Kay, the Chairman of the Gas Committee.



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The IRONCLAD Circulator has forged ahead of all others because of its high efficiency, durability, and ease with which it may be cleaned.

The IRONCLAD is constructed of FIVE PARTS ONLY—and ALL IRON.

VERTICAL Heat and Water Surfaces—eliminating sediment deposit.

No interior baffles or other obstacles to complicate or impair the working.

No joints or seams—but the finest IRON Castings only.

THE Richmond GAS STOVE & METER Co. LTD

WARRINGTON AND LONDON.

Stockport Gas Workers' "Grievances."

The alleged difficulties with Stockport gas workers are likely to be short-lived; and there is little likelihood that the town will become embroiled in another strike. At a meeting of the specially convened Emergency Committee last week, the men were brought to a realization that they were themselves to blame for the non-carrying out of the terms of settlement entered into at the close of the three weeks' strike in October, inasmuch as they had not signed the terms of settlement. At the end of the conference, however, the men's representatives signed the agreement; and Alderman Ferneley (Chairman of the Gas Committee) and the Town Clerk did likewise on behalf of the Corporation. The agreement provides for the "appointing of an expert on behalf of the men, and one on behalf of the Corporation, to consider the conditions in the retort-houses, and recommend what improvements ought reasonably to be made therein; the Gas Committee to carry out such recommendations as far as possible." The allegations of "tyranny" were not taken before the conference; but the Committee expressed their willingness to consider any cases brought to their notice.

South Metropolitan Company's "Personal Service" Department.

Under the heading of "Our Local Industries (No. 1)," the "Kentish Mercury" for the 27th ult. published a chatty account of the history and work of the South Metropolitan Gas Company. The various uses of gas, and its good qualities, were dealt with; and following some remarks on the maintenance system, the article concluded with the following words: "The 'Personal Service Department' of the South Metropolitan Gas Company is an especially useful institution. If a man takes a house, or a shop, or builds a factory, and does not know how to light or warm it, or what power to use, the Company will, at his request, send an expert to advise him as to what should be done, and how best to do it on scientific principles. If he desires the Company to do the work, it will submit an estimate. If a user of power does not know whether to instal a motor or a gas-engine, the expert advice is at his service—if gas would be unsuitable, he is honestly told so. And if the work can be done most economically and efficiently by gas, the Company will send a man to advise him as to how best to do it, free of charge. And the number naturally grows week by week of those who take advantage of these services."

Hope is entertained at Ilfracombe that the coming season will be a record one. The Engineer and Manager of the Gas Company (Mr. J. Armstrong) is accordingly, by means of prominent advertisements in the local paper, directing the attention of the proprietors of hotels and boarding-houses to the value of gas as a labour-saver in connection with culinary operations and the supply of hot water.

Improved Gas Lighting in Kensington.

At the last meeting of the Kensington Borough Council, the Works Committee reported as to the actual annual cost of the scheme for improving the street lighting by gas, and which was fully completed in November, 1912. According to a statement by the Borough Treasurer on the cost of the scheme for the past year, the Committee state that while the actual cost in several instances exceeded the sum estimated, the cost per burner, after deducting the sum paid for the excess supply of gas, has worked out at £2 10s. 5d., compared with the estimated sum of £2 10s. 6d. The increased expenditure shown in certain items is accounted for by the fact that the scheme originally approved has been somewhat extended, with the result that 194 additional burners have been provided. In addition to this certain variations have been made in the lighting work, and a number of whole-time men are now engaged thereon, whereas formerly the men were only so employed part-time. The rates of wages in other cases have been increased, and a supply of new governors at a cost of some £90 has been obtained. The Committee say they consider the financial result as satisfactory.

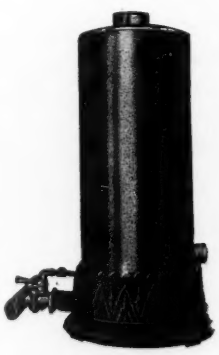
Salary of the Halifax Gas Engineer.

At the monthly meeting of the Halifax Town Council last Wednesday, Mr. Redman (the Chairman of the Gas Committee), in moving the adoption of the minutes, which included an advance of £100 per year in the salary of Mr. W. B. M'Lusky (the Gas Engineer)—making his present salary £700, the same as Mr. John Wilkinson, now Engineer at Nottingham, had when he left—recalled that two years ago, when a Manager was required, there were 57 applications, which were reduced to six; and the salary offered was £500 a year. A deputation visited the works where the six applicants were engaged. They derived many varied impressions; but on reaching Perth (where Mr. M'Lusky came from) they found something approaching an ideal gas-works. When Mr. M'Lusky was engaged, no pledge was given to him in any form; and Mr. M'Lusky did not press for one, having sufficient confidence to abide by the result of his own abilities. Throughout the country there was a feeling of unrest in municipal service; but at the Halifax Gas-Works everything had gone on nicely—largely due to the tact of Mr. M'Lusky in the management of men. Anyone who knew Mr. M'Lusky recognized what a marvellous man he was for missionary work for the sale of gas. He had introduced the high-pressure system; and they were looking for greater development on these lines. Mr. Smithson (Vice-Chairman), in seconding, described Mr. M'Lusky as a first-class Manager. The advance was agreed to without opposition.

The Chairman of the West Bromwich Gas Committee has invited his colleagues on the Town Council to pay a visit to the gas-works, on the 20th inst., to inspect the new vertical retorts. At some future time, arrangements will be made for ratepayers to visit the works.

The GUIDE-POST of PROGRESS

YEAR 1904. YEAR 1913.



NOTABLE FOR THE INTRODUCTION OF THE FIRST HOT-WATER 'CIRCULATOR,' THE WILSON.

NOTABLE FOR THE INTRODUCTION OF THE WILSON "SPIRAL CIRCULATOR." THE CIRCULATOR FOR ALL KINDS OF WATER.

1904:
THE ORIGINAL WILSON "CIRCULATOR."

1913-14:
THE WILSON "SPIRAL-CIRCULATOR."

The HOT-WATER **PIONEERS:**

WILSONS & MATHIESONS, Limited,
Carlton Works, ARMLEY, LEEDS.
LONDON SHOW-ROOMS: 76, QUEEN STREET, CHEAPSIDE, E.C.

Birkenhead Water Scheme.

At last week's meeting of the Birkenhead Town Council, Alderman Bloor made a long statement explaining the reasons why the estimates in connection with the Alwen water scheme had been exceeded by nearly £200,000, which, he said, was the result of various unforeseen circumstances. He stated that the Water Committee were quite willing to take the blame for not having discovered the position earlier; but he claimed acquittal on all other counts. Their default had not increased the cost of the scheme one penny; and no amount of knowledge on their part of the fact that the original estimate was going to be exceeded would have enabled them to get the Contractors to do the work for less. Birkenhead's water supply, based on the cost of a daily delivery of a million gallons of water, would still be one of the very cheapest in the country. A resolution was adopted that, in view of the magnitude of the new water scheme, four additional members be added to the Water Committee. The Council accepted the tender of Messrs. T. Wardle and Sons, of Bristol, for the construction of the Dee tunnel of pipe-line between Connah's Quay and Birkenhead, in connection with the Alwen water supply, for £140,325. It was stated that the work consisted of the construction of a tunnel under the Dee and the laying of the aqueduct or pipe from Connah's Quay to Flaybrick Hill, Birkenhead, a distance of about 13 miles.

Gas Profits at Keighley.—The estimates for the coming year were considered by the Keighley Town Council last week; and advantage was taken of the occasion by the Chairman of the Gas Committee (Mr. Harrison) to make an important statement with regard to the profits of the gas undertaking. He said his Committee had agreed that a further increased grant in relief of the rates would be detrimental to the gas undertaking; and, moreover, the Committee were of opinion that reductions should be made in the amounts so granted—believing that the entire abolition of rate-relief would eventually be beneficial to the prosperity of the town.

Macclesfield Gas Affairs.—From the "Macclesfield Times," March 6: "The eagerly expected duel of words and wits between Alderman Isherwood, the Chairman of the Gas Committee, and Councillor Hewetson, who indulged in vigorous criticism of the Chairman a month ago, did not take place on Wednesday. The Mayor, whose sense of humour is no less keen than his devotion to the proprieties of debate, gave no loophole for the anticipated pleasantries. The minutes of the Gas Committee had no sooner been proposed and seconded, than the Mayor put them to the vote, and they were passed. There was a hearty laugh at the alacrity with which his Worship skated across the danger ice; and not the least jovial participants were Alderman Isherwood and Councillor Hewetson. There will be no resignations just yet, either from the Gas Committee or the managerial staff; and if only unimportant points of difference and trifling incidents in debate were not so readily magnified into 'grave allegations' and 'exciting outbursts,' there would be little reason to fear any at all."

Sale of Stocks and Shares.

At the Mart, Tokenhouse Yard, E.C., last Tuesday, Messrs. A & W. Richards offered, by order of Directors, two new issues of capital—one in the Harrow and Stanmore Gas Company, and the other in the South-West Suburban Water Company—and some "D" stock of the Broadstairs Gas Company by order of executors. The Harrow Company's issue was £4000 of ordinary stock ranking for a standard dividend of 5 per cent., subject to the sliding-scale, but carrying one of about 5⅓ per cent.; and it fetched from £109 to £111 10s. per £100. The Water Company's new issue was 500 £10 preference shares (5 per cent.). These shares are a full trustee investment, and they realized £11 16s. 3d. to £11 17s. 6d. each. The Broadstairs Gas Company's stock, ranking for a dividend of 7 per cent. per annum, but the dividend being paid free of income-tax, carrying one equivalent to £7 8s. 6d. per cent. less tax, fetched £162 10s. per £100 of stock. There was very keen competition for the stocks and shares offered; the stock of the Broadstairs Gas Company constituting a rather interesting item, in view of the proposed amalgamation with the Isle of Thanet Gas Company.

City of London Gas Testing.—The County Purposes Committee of the Corporation of the City of London, at their last meeting, recommended, and the Council agreed to, the appointment of Mr. George Lorimer as Assistant Examiner at No. 1 Testing-Station (No. 106, Fenchurch Street, E.C.), under the provisions of the City of London Gas Act, 1868, and the subsequent Acts relating thereto, during the pleasure of the Court, at the same salary as paid to other Assistant Gas Examiners—viz., £3 per week—in the place of Mr. W. C. Young, who will retire in July next, under the Corporation Pension Scheme.

Price of Gas in Dublin.—In a comment on the fact that the price of gas in Belfast was 1s. 9½d. per 1000 cubic feet, and that a claim was being made for a reduction on the ground that the Corporation were selling at a higher figure than the cost of manufacture, the "Dublin Evening Telegraph" observes that Dublin consumers of gas have to pay 3s. 6d. per 1000 feet—practically 100 per cent. more; and that, unlike Belfast, there is in Dublin no grant in relief of rates, for the reason, of course, that the Belfast gas undertaking is under municipal control, while that of Dublin is not.

St. Mary Church Gas-Works.—A report presented to the Torquay Town Council last week by Mr. F. Chalmers, the Manager of the St. Mary Church Gas-Works, showed that during 1913 the total quantity of gas made was 32,723,869 cubic feet, as compared with 32,103,657 feet in 1912. The unaccounted-for gas was reduced from 8·7 to 7·6 per cent. The number of consumers increased from 1496 to 1564, and the cooking-stoves in use from 853 to 947. It was reported that the Local Government Board had given their sanction to various loans for the extension and improvement of the works—including £123 for a sulphate of ammonia plant, £227 for a tar-tank, £2350 for slot-meter installations, and £600 for mains and services.

THE . .

"Super-Acme"
Gas Cooker.

Where other high-grade Cookers end is the starting point of the "Super-Acme." The "Super-Acme" is not another ordinary Cooker; it is the highest point yet reached in high-grade Gas Cooker Construction.

SOME NOTABLE FEATURES.

Extra large oven.

Hinged and improved hotplate; taps in front; wrought-iron top bars.

Porcelain enamelled inside and out.

Nozzle outlet at back, leaving clear space on top of oven for loose enamelled tray.

All parts are standardized and are not nominally but **actually** interchangeable.

ARDEN HILL & CO.,
"Acme" Works,
BIRMINGHAM.

Ironmongers and the Installation of Water-Heaters.

The following remarks on the above subject appeared in the editorial columns of the "Ironmonger" last Saturday: "With the growing employment of gas and electricity for cooking purposes, and the consequent gradual disuse of the kitchen range, especially in summer time, housekeepers are often at a loss how to get a sufficient supply of hot water for general household purposes, and particularly for the bathroom. To meet this difficulty, auxiliary water-heaters have been designed. . . They fulfil the functions of the range boiler, and allow hot water to be drawn, both in the bathroom and at the sink, when the kitchen range is out of use. Such auxiliary heaters have been on the market for some time; but, owing to the fact that nobody has considered it his special business to popularize them, the sales have been much smaller than the designers anticipated. It would probably be worth while for ironmongers to take up the sale and installation of these appliances in connection with their gas-fitting and plumbing departments. Some have already done so; but the general body of the trade, dreading possibly the competition of the gas companies and the municipal corporations, have left the auxiliary heater business severely alone. It is pointed out, however, that auxiliary heaters stand on a different footing from the gas-fire and the gas-cooker; for, while the last-named appliances can be erected and set in operation without travelling outside the gas fitting trade, the auxiliary heater requires the services of both the gas-fitter and the plumber for its installation. It is claimed that, with perhaps a few exceptions, neither the gas departments of municipal corporations nor private gas companies have authority for undertaking plumbing work; and consequently when they supply a heater and connect it with the gas supply they are obliged to call in a plumber to make the necessary connections with the hot-water service. The plumber, it is said, usually charges so heavily that the gas managers do not care about the business, and are inclined to neglect it."

Campaign against Smoke.—In an article in the Engineering Supplement of "The Times," setting forth the progress of the campaign against smoke, reference is made to the enormous increase of recent years in the number of gas and electrical appliances employed for domestic purposes, especially in London and the larger provincial towns, where coal is comparatively dear and gas cheap. "The records of the gas and electric supply companies," it is remarked, "prove how rapidly the domestic consumer is availing himself of these substitutes for coal; and there is reason to hope that before the first quarter of the twentieth century has passed gas and electricity will have largely replaced coal."

Rival Illuminants at Dawlish.—Owing to complaints about the alleged deficiency of the illuminating power of some of the recently erected electric lights, the Dawlish Town Council decided at a recent meeting to engage an expert to test the quality of the lighting both by gas and electricity. The matter came before the Council again last Wednesday, when a report was submitted by the Lighting Committee recommending that (in view of the cost which would be incurred) the question of engaging an expert be deferred. Mr. Gamlin said that he was very much surprised by this recommendation. The Council would save money by having a proper test of the lighting; for at present some of the lamps were not giving more than one-half the stipulated candle power. Mr. Leaman thought it would be useless to have an expert for a short time; and the cost of tests over a long period would be considerable. It would be wise to let the matter go for the present. If there was anything radically wrong, he should be the first to move in the matter. The Committee's recommendation was adopted.

Within the premises of the Newcastle-upon-Tyne Co-Operative Society there was much annoyance felt on Monday evening of last week, when, owing to the fusing of the main electric cables, the various departments were suddenly plunged into darkness. The breakdown could not be repaired quickly; and as there were no other efficient means of artificial lighting readily available, the premises were closed for the night. The inconvenience did not end there, however, for a party had engaged one of the rooms for a dinner; and this was served under difficulties—candles having to be requisitioned. The hall, again, had been rented for the evening by a club for a whist drive; and a large number of people assembled.

The Newmarket Gas Company have been holding a successful gas exhibition in the Town Hall, with demonstrations by Mrs. Godfrey Sutcliffe. At the opening, the Chairman of the Company (Mr. R. Stephenson, J.P.) drew attention to the developments in gas appliances which are always going on. He said the Company had very nearly 1500 slot-meters in use in the cottages. About one-half of these customers had cookers, while the other half had gas-rings, grillers, or something of the kind; so that these cottagers were using gas both for lighting and for cooking. Various cookery prize competitions were held; and the firms exhibiting included Messrs. John Wright and Co., Messrs. Fletcher, Russell, and Co., Messrs. Wilsons and Mathiesons, and Messrs. Norton and Brewster. The Company themselves made an interesting display. Unfortunately, the Gas Manager (Mr. J. H. Troughton) was kept away from the opening by indisposition.

The report to be submitted at the annual meeting on Thursday of the Davis Gas-Stove Company states that the net profits for the year ended Dec. 31 amounted to £25,515, to which must be added the sum brought forward from 1912 (£5345), giving a total divisible profit of £30,860. Deducting from this the dividend on the 5½ per cent. preference shares for the year (£3237) and the interim dividend on the ordinary shares at the rate of 5 per cent. per annum for the half year to June 30 (£1471), there remains a balance of £26,152. It is proposed to distribute £4414 in paying a dividend on the ordinary shares at the rate of 15 per cent. per annum for the half year to Dec. 31 (less income-tax), making 10 per cent. for the year; to add £12,500 to the reserve account, making it £62,500; to place £2000 to the provident fund; and, after providing £1690 for the proportion of profits payable to the Directors, there will be £5548 to carry forward.

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EVERY REQUIREMENT.

Our range of cooking apparatus is so extensive, that whatever your needs may be, we can please you in every way.

PARKINSON

GAS APPLIANCES

are practical Stoves with an attractive, distinctive, and bold appearance. The absence of dust collecting recesses enables them to be always kept clean.

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"PARKINSON"

AND SATISFACTION IS ENSURED.

THE PARKINSON STOVE CO. LD.

BIRMINGHAM & LONDON.

Messrs. Biggs, Wall, and Co., have secured an order for an installation of their patent "Rapid" retort-charging machines for the Cambridge (New Zealand) Gas-Works.

The National Time Recorder Company, of No. 5, Blackfriars Road, S.E., have, after exhaustive tests in competition with four other makes of time recorders, been successful in obtaining the contract for the supply of their patent check-action automatic time recorders to the Metropolitan Water Board.

In accordance with the understanding arrived at when Mr. W. B. Leech was appointed General Manager of the Leeds Corporation Gas Department, he has severed his connection with the firm of Leech, Goodall, and Co. The partnership was dissolved as from Jan. 31; and the "Gazette" notice states that Mr. Charles A. Goodall and Clayton, Son, and Co., Limited, will continue to carry on the business at the same address and under the same style.

The report of the Directors of the Richmond Gas Stove and Meter Company for the year ended Dec. 31, to be presented to the meeting at Warrington to-day, states that the balance standing to the credit of profit and loss account (less debenture interest and contingent reserve), including the amount brought forward, is £36,720, which the Directors recommend be appropriated as follows: Depreciation, £6202; a dividend on the preference shares at 6 per cent. per annum (less income-tax), £5881; a dividend on the ordinary shares at 10 per cent. per annum (free of income-tax), £8161; a bonus of 6d. per share on the ordinary shares, £2040; to the reserve fund (bringing it up to £55,000), £5000; carry forward (subject to Directors' remuneration), £9435.

At the meeting of the London County Council last Tuesday, the recommendation of the Education Committee to accept the tender of Messrs. Parkinson and W. & B. Cowan, Limited, for the repair of the gas-meters in the Council's schools for a period of three years from the 16th prox., to which reference was made in the "JOURNAL" last week (p. 606), was agreed to.

The Salford Corporation Gas Committee are endeavouring to popularize coke as a fuel, not only for steam raising and furnaces, but also for the household. They have issued posters and leaflets pointing out how to make the best use of coke, which material, it is stated, is comparatively the cheapest fuel on the market. One important consideration to be borne in mind by the public is that coke is smokeless, and that those who use it will be contributing their share towards the purification of the atmosphere, and so help to bring back the many hours of sunshine which are lost by foul smoke.

The report to be presented at the meeting in Birmingham to-morrow of John Wright and Eagle Range, Limited, states that the balance of the revenue account for the year ended Dec. 31 (after augmenting the contingent reserve), including £10,710 brought forward, is £70,395. After deducting the interim dividends, there remains at disposal £51,944, which the Directors recommend be appropriated as follows: A dividend at the rate of 6 per cent. per annum for the half year on the preference shares (less income-tax), £2401; a dividend of 2s. 6d. per share on the ordinary shares (free of income-tax), £26,750; and to the reserve fund, £12,000. The amount left to be carried forward will be £10,793.

GAS COMPANIES IN THE STOCK EXCHANGE.

The Stock Exchange has had a most disagreeable week, which, while it was bad enough at any time in that period, was at its worst at the close; so that markets finished off in a state of serious depression. Summed up in brief, the gloomy factors may be indexed as Ulster, Mexico, Brazil, and Paris, coupled with some anxiety concerning certain Continental centres where speculation is rather suspected of having been too rash. Markets of all sorts were affected, though some were worse than others; and the prices at the conclusion of business show an almost unbroken array of losses. The opening on Monday was very inanimate, and markets were dull all day, giving way from sheer inaction. In addition to other troubles, money began to get tighter. Government issues were weaker generally, and Consols fell ¼. Rails were avoided and hardly in evidence at all. Transatlantics and Foreign were lower. Tuesday was very depressed, and flatness ruled all round. Home and Foreign affairs were eyed gloomily, and Continental realizations helped to make things darker. Prices all round shrank. Consols lost ½; and all the leading departments were lower. Wednesday was a dull day; but markets were not quite so uniformly bad as on Tuesday. Consols were ¼ lower, and Rails showed declining prices. But the final figures were not the worst of the day; and Transatlantics were supported locally. Thursday certainly opened with better promise, but failed to maintain its cheerfulness, and later movements grew very irregular. Consols managed to pick up ¼; but Rails ruled flat, and Americans were quite uneven. Every bit of brightness had faded away on Friday, and persistent depression overhung every market; the disquieting factors above noted being dominant. Consols were lopped of another ¼, Rails were too weak to stand up against some moderate selling, and Transatlantics were a prey to grave rumours. Things came to a climax on Saturday, when the state of depression was acute. All markets were hit, but Consols only lost ¼ for the account. For money, the price closed at 74½ to 75—a loss of ⅝ in the week after making allowance for *ex div.* quotation. In the Money Market, there was a very fair demand, and rates became harder; but they eased again before the close. Business in the Gas Market again showed a very narrowed sphere of operations, and, excluding the two biggest issues, there was barely a score of transactions for distribution among all the rest. The tone was not equal to the usual strength of the market, though that could scarcely be otherwise in a week of such general depression. In Gas Light and Coke issues, the ordinary was pretty busy at rather easier figures; transactions ranging from 100⅜ to 101¾—a fall of 1. In the secured issues, the maximum realized from 76 to 79 (a rise of 1½), and the debenture 73⅜ and 75. South Metropolitan was much more active, and changed hands at 110½ to 111¼, and the debenture was done at 74. In Commercials, the 4 per cent. marked 106¼, the 3½ per cent. 104⅛, and the debenture 72 and 73. Among the Suburban and Provincial group, British made 45⅝, ditto debenture 90½, South Suburban 115½, and Tottenham "B" 115½. In the Continental companies, Imperial realized 174 to 176 (a fall of 1), Union 81½, and European 18 and 18¼. Among the undertakings of the remoter world, Oriental was done at 120, Ottoman at 7 7/16 (a fall of ⅜), Primitiva at 6 11/16 and 6 13/16, and ditto preference at 5 1/16 to 5 3/32.

OFFICIAL QUOTATIONS AT THE CLOSE OF THE WEEK.

Bank Rate (fixed January 29), 3 per cent. Last year, 5 per cent. Consols, 74½—75. Previous week, 75⅜—76¼.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment. £ s. d.
£			p.c.				
1,551,868	Stk.	Oct. 15	4	Alliance & Dublin Ord.	60–64	..	6 5 0
374,000	,,	Jan. 15	4	Do. 4 p.c. Deb.	78–81	..	4 18 9
280,000	,,	Oct. 15	7½	Bombay, Ltd.	6–6½	..	5 15 5
50,000	10	Feb. 26	16	Bourne- 10 p.c.	27⅜–28¾	..	5 11 4
852,500	10	,,	7	mouth Gas B 7 p.c.	14⅜–15	..	4 18 4
75,000	10	,,	6	and Water Pref. 6 p.c.	13⅜–14*	+½	4 5 9
380,000	Stk.	Feb. 26	14	Brentford Consolidated	256–261*	..	5 7 3
330,000	,,	,,	11	Do. New	202–207*	..	5 6 3
50,000	,,	,,	5	Do. 5 p.c. Pref.	109–111*	..	4 10 1
206,250	,,	Dec. 11	4	Do. 4 p.c. Deb.	93–95	..	4 4 3
217,380	Stk.	Feb. 26	11	Brighton & Hove Orig.	196–201*	..	5 9 5
244,200	,,	,,	8	Do. A Ord. Stk.	145–148*	..	5 8 1
530,000	20	Sept. 26	12½	British	45–46	..	5 8 8
120,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb. Stk.	90–92	..	4 7 0
245,771	Stk.	,,	4	Buenos Ayres 4 p.c. Deb.	89–91	..	4 7 11
100,000	10	—	—	Cape Town & Dis., Ltd.	2–3	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	2½–4½	..	—
100,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.	73–78	..	5 15 5
157,150	Stk.	Feb. 26	5	Chester 5 p.c. Ord.	106½–108¼*	..	4 12 2
1,513,280	Stk.	Feb. 12	5/9/4	Commercial 4 p.c. Stk.	105½–107½	..	5 1 7
560,000	,,	,,	5⅝	Do. 3½ p.c. do.	103½–105⅝	..	5 1 1
475,000	,,	Dec. 11	3	Do. 3 p.c. Deb. Stk.	71–73	..	4 2 2
800,000	Stk.	,,	4½	Continental Union, Ltd.	80–83	+1	5 8 5
200,000	,,	,,	7	Do. 7 p.c. Pref.	117–122	..	5 14 9
492,270	Stk.	—	6⅜	Derby Con. Stk.	123–125	..	4 12 0
55,000	,,	—	4	Do. Deb. Stk.	102–104	..	3 16 11
1,002,180	10	Jan. 15	10	European, Ltd.	17⅞–18½	..	5 8 1
16,386,660	Stk.	Feb. 12	4/17/4	Gas- 4 p.c. Ord.	100–102	–1	4 15 6
2,600,000	,,	,,	3½	light 3½ p.c. max.	75–79	+1⅛	4 8 7
4,062,235	,,	,,	4	and 4 p.c. Con. Pref.	95–98	..	4 1 8
4,674,850	,,	Dec. 11	3	Coke 3 p.c. Con. Deb.	73–75	..	4 0 0
258,740	Stk.	Sept. 11	5	Hastings & St. L. 3½ p.c.	90–92	..	5 8 8
70,000	10	Oct. 15	11	Hongkong & China, Ltd.	16½–17½	..	6 7 6
131,000	Stk.	Sept. 11	7⅜	Ilford A and C	150–153	..	4 19 8
65,780	,,	,,	6⅜	Do. B	118–120	..	5 2 1
65,500	,,	Dec. 30	4	Do. 4 p.c. Deb.	89–91	..	4 7 11
4,940,000	Stk.	Nov. 13	9	Imperial Continental	173–178	–1	5 1 1
1,235,000	Stk.	Feb. 12	8½	Do. 8½ p.c. Deb. Red.	83½–85½	..	4 1 10
200,242	Stk.	Aug. 28	6½†	Lea Bridge Ord. 5 p.c.	118–121	..	5 7 5
561,000	Stk.	Feb. 26	10	Liverpool United A	206–208*	..	4 16 2
718,100	,,	,,	7	Do. B	141½–143½*	..	4 17 7
306,083	,,	Dec. 30	4	Do. Deb. Stk.	98–100	..	4 0 0
63,480	Stk.	Dec. 30	3	Maidstone 3 p.c. Deb.	65–67	..	4 9 7
£			p.c.				
75,000	5	Dec. 11	6	Malta & Mediterranean	4⅜–4⅞	..	6 3 1
250,000	100	Oct. 1	4½	Met. of Melbourne 4½ p.c. Deb.	98–100	..	4 10 0
541,930	20	Nov. 27	4	Monte Video, Ltd.	11⅜–12½	..	6 10 8
1,775,892	Stk.	Feb. 26	4½	Newc'tle&G'tesh'd Con.	100–101*	+½	4 9 1
529,705	Stk.	Dec. 30	2⅜	Do. 3½ p.c. Deb.	82–88	..	4 4 4
55,940	10	Feb. 26	1/14.0	North Middlesex 7 p.c.	12½–13½	..	5 14 1
300,000	Stk.	Nov. 27	8	Oriental, Ltd.	120–125	..	6 8 0
60,000	5	Sept. 26	10	Ottoman, Ltd.	7¼–7⅜	–⅛	6 9 0
60,000	50	Feb. 26	13	Portsea, Island B	127–130*	..	5 0 0
100,000	50	,,	12	Do. C	118–121*	..	4 19 2
249,980	5	Oct. 15	8	Primitiva Ord.	6⅛–7	..	5 14 4
499,960	5	Dec. 30	5	,, 5 p.c. Pref.	5–5⅛	..	4 15 3
521,600	100	Dec. 1	4	,, 4 p.c. Deb.	93–96	..	4 4 3
346,198	Stk.	Dec. 30	4	River Plate 4 p.c. Deb.	87–89	..	4 9 11
275,000	5	Sept. 26	12	San Paulo, Ltd.	—	..	—
150,000	10	,,	6	Do. 6 p.c. Pref.	10¼–11⅜	..	5 5 6
125,000	50	Jan. 2	5	Do. 5 p.c. Deb.	48–50	..	5 0 0
135,000	Stk.	Aug. 28	10	Sheffield A	225–227	+2	4 8 1
209,384	,,	,,	10	Do. B	225–227	+2	4 8 1
523,500	,,	,,	10	Do. C	225–227	+3	4 8 1
90,000	10	Oct. 15	7½	South African	10¼–11½	..	6 10 5
6,429,895	Stk.	Feb. 12	5/9/4	South Met., 4 p.c. Ord.	110–112	..	4 17 7
1,895,445	,,	Jan. 15	3	Do. 3 p.c. Deb.	73–75	..	4 0 0
209,820	Stk.	Feb. 26	8½	South Shields Con. Stk.	155–157*	..	5 8 3
952,795	Stk.	Feb. 26	6	S'th Suburb'n Ord. 5 p.c.	114–116*	..	5 3 5
60,000	,,	,,	5	Do. 5 p.c. Pref.	110–112*	..	4 9 3
117,058	,,	Dec. 30	5	Do. 5 p.c. Deb. Stk.	113–115	..	4 6 11
594,740	Stk.	Nov. 13	5	Southampton Ord.	101–104	..	4 16 2
120,000	Stk.	Feb. 12	7⅜	Tottenham A 5 p.c.	135–138	..	5 6 10
543,940	,,	,,	5½	Tottenham District B 3½ p.c.	114–116	..	5 1 3
149,470	,,	Dec. 30	4	Tottenham District 4 p.c. Deb.	89–91	..	4 7 11
182,380	10	,,	5	Tuscan, Ltd.	5–6	..	8 6 8
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	95–97	..	5 3 1
236,476	Stk.	Aug. 14	5	Tynemouth, 5 p.c. max.	111–113	..	4 8 6
				Wandsworth, Wimbledon, and Epsom—			
30,000	Stk.	Feb. 26	8⅜	Wandsworth A 5 p.c.	151–156*	..	5 7 4
255,636	,,	,,	6⅜	,, B 3½ p.c.	129–134*	..	5 2 7
108,075	,,	,,	5/17/8	,, C 3½ p.c.	110–115*	..	5 2 0
352,000	,,	,,	6⅛	Wimbledon 5 p.c.	108–113*	..	5 8 3
98,000	,,	,,	6⅜	Epsom 5 p.c.	112–117*	..	5 13 3
88,416	,,	Dec. 30	3	3 p.c. Deb. Stk.	71–73	..	4 2 2

Prices marked * are "Ex Div." † Next Dividend will be at this rate.